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BIENNIAL REPORT
OF THE
INSPECTOR OF MINES

OF THE
State of Montana

For the Years

1911 - 1912

WILLIAM WALSH, Inspector.

WILLIAM OREM, Deputy Inspector.

DECEMBER 1, 1912

"INDEPENDENT PUBLISHING COMPANY, HELENA, MONTANA."



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Helena, Montana, December 1st, 1912.

Hon. Edwin L. Norris,
Governor of Montana,
Helena, Montana.

Sir:—

I have the honor to herewith submit my biennial report, together with that of the Deputy State Mine Inspector, W. B. Orem, for the years ending November 30th, 1911 and 1912, complying with the law requiring reports from State Officers.

Very respectfully,

WILLIAM WALSH,
State Inspector of Mines.

CONTENTS.

	Page.
Introductory	5-9
Future of Mining	9-10
Fortunes and Failures in Mining	10-11
The Past, Present and Future of Copper	12-16
Compensation for Quartz Mine Accidents	16-17
Rigid Discipline Needed in Mines	17-18
Regulation of Mine Ventilation	18-19
The Use of Compressed Air for Ventilation Purposes...	19-21
Politics and Mine Inspections	21
Dangers of Electric Wires and How to Avoid Them....	21-23
Some Suggestions	23-24
Opening Mine Levels	24
Mine Hoisting Signals Code	24
Safe Use of Explosives	25
Accidents in the Use of Explosives	26-27
Accidents	27-28
Notices and Recommendations	29
Number of Mines Inspected, 1911	29
Number and Causes of Accidents	29-30
Number of Mines Inspected, 1912	30
Number and Causes of Accidents	30
Mines Inspected, Men Employed, Accidents and Per- centages	31
Fatal Accidents, Their Nature and Where Occuring for the year 1911	32-33
Non-fatal Accidents, 1911	33
Fatal Accidents, Their Nature and Where Occuring for the year 1912	34-35
Non-fatal Accidents, 1912	35
Mineral Output of the United States	36
Mine Output of Metals in the State by Counties, U. S. Survey, 1911	37
Production of Gold, Silver, Copper, Lead by Counties, 1910	38
Montana Mineral Output	38

	Page.
Production of Principal Metals in the United States, 1910-1911	39
Placer Mining	39-40

COUNTIES—

Beaverhead	41
Broadwater	41-46
Blaine	46-48
Cascade	48-51
Deer Lodge	52-55
Fergus	55-59
Flathead	59-60
Granite	60-65
Jefferson	65-73
Lewis and Clark	74-80
Lincoln	80-83
Meagher	84-85
Missoula	85-90
Madison	90-97
Park	97-99
Powell	99-101
Ravalli	101-102
Sanders	102-105
Sweet Grass	105-106
Gallatin	107
Silver Bow	115-128

Introductory.

I want to take this opportunity of thanking the several managements for courtesies extended, which greatly assisted me in making the proper inspections. In my investigations at the mines I have everywhere been courteously received and assisted by those in charge, an assistance that has gone far towards enabling me to properly discharge my official duties with comfort and dispatch, and for this courtesy I beg to return an appropriate acknowledgement to the several managements.

By reason of a law having been enacted by the last legislative assembly providing for the better protection for the miners, I take this opportunity of thanking each and every one of that honorable body for realizing the dangerous occupation of the miners, which has resulted in untold benefits and the saving of many lives, and I wish to thank Governor Norris for the able manner in which he placed the recommendation before the assembly. It will long be remembered by the miners of this state. During the annual tour of inspections I found a majority of the mines operated in a fairly safe condition. I found it very difficult to make some of the operators realize that the law would have to be obeyed in every particular in safeguarding the lives and health of the miners.

During the year Montana has maintained its position in the first rank of the leading precious metal producing states of the nation. In the face of changing conditions with their resultant periods of industrial activity and depression, the production of gold during the past ten years has increased throughout the state, and will continue to increase at a much more rapid rate under the present development, and if studied by the miner and mining investor can hardly fail to excite such an interest in the gold bearing rocks and gravels of this state as would lead to their active development. The prospecting for and the development of the purely silver bearing lodes, has practically ceased, excepting in the very high grade districts, and in these, they are only able to operate, merely battling for existence under prevailing conditions, their owners waiting for the turn in events which will bring with it such prices for the

products of their mines as will permit the mining of the metal at a reasonable profit. It must not be presumed from the foregoing that Montana is not a large silver producing state. On the contrary, silver is one of its chief metals.

In the settlement of the middle and western plains the Federal Government extended to the home-seeker every assistance. The land was free; the cost of location, inconsiderable; the requirements for improvement within the reach of the poorest man. These inducements brought people from every part of the world to secure a home. They located their lands, established prosperous homes and became citizens. This broad-gauged policy peopled states, made vast, vacant areas productive of almost incalculable wealth and made this nation the greatest in the world. The same policy of encouragement and assistance should be extended to the prospectors in the mineral section of the country. They take the gamble of their search and development. They may toil and search for years before securing a location that will bring them any recompense. It is through their untiring efforts that mines are found which after development add millions to the wealth of the state, and they should be extended every liberty and every assistance possible along these lines.

I have endeavored to keep before me at all times the fact that we are entering, as far as the State of Montana is concerned, a new and untried field. All who have given the industry any thought must realize that Montana has long since passed the experimental stage and that her mineral resources, under proper exploration, can be depended upon for profitable returns and now that it has reached a permanent business basis I believe that more attention should be paid to prospecting and to the developing of the various districts throughout the entire state. Just such a condition confronts us at this time. Mining is now a straight out and out business and must be backed by technical knowledge. Furthermore I want to say to you, that any man who tells you that the ores in Montana's mountains are exhausted, is not a real miner. He is probably one of the office sort of miners who sits and swings in a swivel chair.

No other state has a greater variety of resources than Montana. The latest discoveries of Tungsten and Onyx marbles mark some of its growing industries. Montana has the fundamental qualities for a much greater state than it now is.

It is by no means anything new for abandoned mining projects of the distant past to become contributors to modern wealth by reason of the application of new principles of mining or metallurgy and the utilization of new and improved power and transportation facilities.

In no year in the history of the Butte District has so much work in the nature of development been done as during the past twelve months. A vast territory to the north of the copper zone has been explored and has proven to carry extensive ore bodies in copper, silver, gold and a large percentage of zinc. The development exceeded by fifty per cent even the large amount of work that was done some four or five years ago during the height of the copper boom, when a score of new companies were engaged in the work of developing new mines. At that time less work of that character was done by the large companies. The past year the small and numerous new companies were entirely out of it, with the exception of a few, and the work was confined to the large companies, which are doing extensive development on the several properties controlled by them. A great change has taken place in Silver Bow County by electricity taking the place of steam which will in the future add to the life of the camp at least twenty years, by cheapening the cost of production by which low grade ores can be mined at a profit which otherwise would remain untouched at the present system of mining. While it is impossible for even an estimate of a reliable character to be given of the cost of production until after electricity has entirely taken the place of steam, it has been estimated that there will be a reduction in the cost of production of one cent per pound of copper produced.

The mining industry in Montana is looking brighter and is showing improvement in numerous directions. Conditions have shaped for a greater production in the near future. That is especially true of the gold camps. Radersburg, Marysville, Zortman, in the Little Rockies in Fergus County, and untold wealth in the hills west of Anaconda, where, if the prospecting and developing work is kept up, the future will prove it to be the greatest gold district in the state. The Elkhorn district has taken on a new lease of life and, in fact, the entire district adjacent to Helena. In the Ruby country and in many portions of Madison, Jefferson, Lewis & Clarke and Beaverhead

Counties they are awaiting the Capitalist. In the western part of the state, in Flathead and Lincoln Counties, that in former years have yielded millions of dollars in mineral wealth, after a long period of idleness, mines are in operation today and show a condition of encouragement. The values are not theoretical and many of the mines require only more modern methods of mining to yield even greater wealth than ever in their history. While Montana has never boasted of its mines, other than the big copper properties which are famous the world over, it has some of the largest mineralized zones known in the world today. Our gold bearing districts are not excelled in any country and the future will prove it. No doubts can exist as to the fact that there are good opportunities in the state for those who investigate. Recognition of this fact has led to the making of more than one fortune in Montana.

In presenting to the people my eighth annual report on the mining industry and the very successful results from the mines of the state during the last year, I desire to say that present indications point to continued satisfactory returns. While the total mineral production shows a small decrease, it is exceedingly satisfactory to be able to inform the outside world that the two principal branches of the industry; namely, quartz and placer mining, show substantial increases. I am, however, of the opinion that our mining industry will in the future not only maintain its present prosperous position but will be annually extended in various directions and add largely to our wealth and prosperity. In my previous reports I took occasion to remind the outside world of our great mineral resources and the great benefits conferred on our people by our mining industry. These advances cannot be too often impressed on the outside. I therefore again desire to emphasize that reasonable financial assistance toward developing our mineral resources is a profitable investment. During the year discoveries of gold that may lead to important developments outside our hitherto known mining districts have been reported and the discoveries of lodes showing satisfactory assay values was discovered in the Warm Springs district in Jefferson County. This find is being energetically and extensively prospected by the parties interested who anticipate profitable results. The prospecting for petroleum, onyx and tungsten is becoming an important branch of our mining industry, and in the near future will be, according to present indications, more promising

than on any previous occasion. The operations being carried on by the companies concerned in different parts of the state are being carefully watched and periodically examined by this department. While the most important quartz mining districts suffered serious set back at times, it is gratifying to note that the yield from the mines as a whole shows a substantial increase. In the development of other minerals, such as copper, manganese and antimony, much progress was made during the year. Scheelite shows an increased production and a substantial increase in value, due, however, to enhanced prices. As mining operations at present in their initial stage are sufficiently advanced and developed to become productive, the prospects of quartz mining throughout the state are encouraging, as a result of improvements that are being made in mining machinery and in the processes for the treatment of ores, together with the investment of additional capital and the opening up of new prospects, an increased yield from this important section of the gold and silver mining industry may be expected. In conclusion I may say that in view of the developments that are now taking place, the prospects of our mining industry may be considered as eminently satisfactory.

FUTURE OF MINING.

The demands of civilization for minerals and their products is likely to increase with time, rather than decrease. Of course, all the big deposits of the world have not yet been discovered, but a large portion of the world has been searched for the required minerals with more or less success. As the ores of useful methods are not produced by nature as fast as man depletes existing deposits, it is simply a matter of time before the human race will have exhausted the more easily accessible and richest deposits, and will have to fall back on those at present considered unprofitable under present conditions. In olden days slave labor made it possible for ore to be worked that otherwise must have been left for a later date. At the present time not only is the condition of the working mines better than of yore, but modern appliances and methods enable every low grade rock to be handled. There is no reason why future generations should not improve on present methods so that they can deal with ore of a grade now considered not worth while touching. When reporting on property it is not sufficient to look at it from the past or even the present, but one must look

ahead to a certain extent. Some properties can be condemned as out of the question at once. Others warrant more careful investigation and often the combined opinions of two or more specialists. For one man cannot be an expert on all subjects. He may be very good on technical points concerning the working of a mine, but may lack the intimate knowledge necessary to extract the metal from the ore by the most up-to-date methods suitable for that particular ore, allowing for local conditions. Again, his business knowledge may be so slight that he would be unable to market the product to the best advantage or advise as to the best method of financing the enterprise. For a mine may be good and the ore successfully treated and yet the venture prove a failure from a financial point of view owing to unsuitable capitalization or some other foolish arrangement. Then there is the market price of the metal to be considered, requiring a knowledge of the world's supply and demand. If a high price is likely to be obtained, then small deposits that would not otherwise be worked may be brought forward with advantage, as has recently been the case with copper ventures. If a metal reach too high a price then some substitute is sought for its common use. This tends to bring the price down again. Or one metal may be affected by another or by some special trade, such as tin, which is largely produced in silver currency countries so that when silver is high it cannot purchase the same amount of labor as when low. Also the tin being chiefly used in the manufacture of tin plate and tin plate being largely used in meat preserving works, the demand for that metal may be influenced by the canned meat industry. As an engineer has enough to do to keep up to date in his own particular line, he has to depend on the business man to a great extent for information of the wheels within wheels likely to affect the demand for and the price of the metal in which he is interested.

FORTUNES AND FAILURES IN MINING.

Mining affords opportunities for making fortunes unsurpassed by any other industrial pursuit. Gold, silver, copper, lead and many of the other metals do not disappear from the possession of man nor go back to the source from which they came. They are cumulative and add a permanent increment to the wealth of the world. Hence mining gives to mankind material as lasting as the earth itself and many of the greatest fortunes

of modern times have been made by men who were shrewd investors in this class of property and possessed of the natural qualities necessary for the work. These men understood well the conditions of attaining success in any pursuit. Selecting good properties with which to cast their fortunes, they had the control of mines and employed only the most skilled and energetic men as managers, who could instill enthusiasm into every detail of the work under them. The greatest opportunities in mining come from investments in prospects that show merit, no matter whether or not they contained only low grade ore. Occasionally rich veins of ore are found, but these are more or less pockety and in the end do not prove equal to expectations. But low grade deposits afford inducements for their development. Men of the greatest foresight are looking for such propositions and the fortunes of mining will come largely from them. These ores will become all the more attractive for investment as technical skill and inventive genius improve the means of extracting their metals. Opportunities will be found to re-work rich tailings, the monuments of waste of former metallurgical processes, and the immense cyanide plants that have been constructed in the state are treating this material for the fourth time at a profit. Fortunes in mining have been made possible through the wonderful growth of the mineral industry in the last half century. During this time the agriculture of the world has only doubled; the products of manufactures have only quadrupled, while the output of the mines has been more than thirteen-fold increased. In this wonderful development of the mineral resources of the United States now yields in tonnage about one-third of all, Great Britain about one-third and the rest of the world the balance. Yet the value of the mineral products of the United States is far greater than that of Great Britain or any other nation. It is from the development of these industries that so many fortunes have been made, and they have given to history the names of the Rockefellers, Morgans, Fair, Mackey, Hurst, Clark, Daly, Ryan, Cole, Walsh, Carnegie and many others and have made the United States the rival of the world in the mining industry.

THE PAST, PRESENT AND FUTURE OF COPPER.

The great copper industry of the present day is a thing of small beginnings. One century ago, in the year 1811, the world's production of copper was a trifle under ten thousand long tons, an amount smaller than was secured last year by any one of more than twenty different mines. During the present years the great Anaconda Mine of Butte has produced nearly every month as much copper as was supplied by all the mines of the world in the entire year of 1811. Fifty-one years ago, in the year 1862, the world's output of copper was but a trifle more than one hundred million pounds, a production that was exceeded in 1910 by the Anaconda American Smelting Securities Company and Dodge & Co. The production of the year 1900, the last of the nineteenth century, was just fifty times as great as that of the year 1800. Should the same ratio of increase be maintained during the twentieth century, the output of the year A. D. 2000 would be 24,318,150 long tons of copper, twenty-five times as much as the present production, and even a fifty-fold increase for the twentieth century would allow an average increase of less than four per cent while the average increase for the decade beginning in 1900 and ending in 1910 was almost exactly seven per cent, compounded yearly. Those who foresee a complete collapse in the copper industry would do well to give consideration to the actual increase during the past. The copper industry does not move forward at even an approximately steady rate from year to year, but is given to advancing by great leaps almost inevitably followed by periods of quiescence, of, even, an actual retrogression. High prices for the metal stimulates production while curtailing consumption and as a direct consequence output is increased which decreases prices which in turn brings about decreased production, due to the inability of small and weak producers to stand the strain of low prices. Decreased production again brings about high prices and the cycle is begun anew. Much the same conditions existed in the American iron and steel industry and continued for about fifty years, until the formation of the United States Steel Company, which, while unable to prevent periods of depression as its sponsors fondly hoped, has proven a wonderfully steadying factor in the iron and steel market, serving the purpose of a gigantic balance wheel. Figures of production and consumption of any

given commodity in universal use differ from year to year according to whether a surplus is accumulated or a preceding surplus draw upon, but over a long term period production and consumption necessarily are the same and figured by decades it is safe to say that the figures of production are practically the figures of consumption. At present there is a copper surplus of which much is heard. But to show how comparatively unimportant the present surplus is when compared with the figures of output for the preceding decade it may be stated that the world's surplus of copper at the present time is slightly less than 300,000,000 pounds of finished metal, or a trifle under 135,000 long tons, an amount less than 5.5 per cent of the total production of the decade and equivalent to only about eight weeks' supply of copper at the present time, measuring the supply either by productive capacity or by consumption demand. Strange to say the copper mines, which are vitally interested in extending the use of copper, were somewhat slow in adopting electric power, but rapid progress has been made in this direction during the past decade and all of the mines of Butte are now electrified. While there has been a great increase in the use of electric energy in that direction, the constantly increasing use of hydro-electric power is now restrained and further restraints are threatened by conservationists. The newly adopted system at the Anaconda mines in Butte, which combines the utilization of hydraulic, electric and pneumatic power, offers great possibilities of pliancy and economy, and the lead of the Anaconda is likely to be followed by many other important mines.

There were 76 deep mines in Silver Bow County in 1911-12 against 58 in 1909-10. There were a greater number of lessees operating in the district than in 1910. The output of the county, with the exception of that for Divide Creek and German Gulch districts, is that of this region which embraces all of Butte and Independence sections. During the latter part of 1910 a curtailment in production of copper was put into effect by the Anaconda company. Development continued at the Anaconda and allied mines and some high grade ore bodies were opened up on the deep levels. There was no curtailment of the development work and all the mines of the group were working with the exception of the St. Lawrence and portions of the Anaconda and the Neversweat. On the 1,800 foot level

of the West Colusa and on several levels in the different properties an ore body of large dimensions and high grade was opened. In the Badger mine group immense bodies of high grade copper ore have been developed. Both the Minnie Healy and the Rarus were worked through the Tramway shaft, which has been sunk to a depth of 2,000 feet. The work of connecting the large four-compartment shaft of the Belmont with all the levels of the Anaconda mine proceeded throughout 1911-12, and the shaft will be put in operating condition to the 2,400 foot level. The fire in certain parts of the mine caused but little delay during 1911-12, the shaft being retimbered the entire 2,400 feet and some ore mined in the lower levels was raised through the St. Lawrence and Neversweat shafts. The St. Lawrence shaft is to be used for a new drainage system of all the mines and will be sunk to the 2,800 foot level. The crosscut south on the 2,800 foot level of the High Ore shaft was driven to a point vertically under the Anaconda shaft and connected by diamond drill holes with the bottom of that shaft. The Original mine, which was consolidated with the Anaconda interests in May, 1910, was vigorously developed and large bodies of high grade copper ore were opened on the 2,300 foot and the 2,400 foot levels. Both eastward and westward connections were being made with the levels of the Gagnon shaft at several points, it being the intention to hoist all ores in the vicinity of the Original and Gagnon shafts through the Original shaft, which is equipped with all modern hoisting appliances. The Badger State shaft of the Boston & Montana mines is situated in a different section of the Butte camp, north from that in which are located the other shafts, and is now 1,800 feet in depth, 283 feet having been sunk during the year. Several veins of great promise are said to have been developed. In all there were 31.1 miles of development work in the form of drifts, crosscuts, upraises, winzes and shafts performed in the Anaconda group of mines in 1911-12, the sinking of shafts to additional depths aggregating 3,765 feet, and its mines produced in 1911 ore aggregating 4,326,227 tons and copper precipitates recovered from mine waters were 4,413 tons additional. An important improvement in hoisting there is the addition of a compressed air plant. It is proposed to do all the hoisting by means of compressed air. Air is generated at this plant and it is expected to reduce operating expenses materially, and

a further reduction of cost may be attained by the use of electrically driven pumps. The doing away with steam boilers and consequently with the use of coal will be an event of much importance. The new plant operated by electricity brought 170 miles from Great Falls, consists of three Nordberg air compressors at the Reduction Works. Refinements in operation tending towards lessened cost were carried on during 1910-11 with a small unit of a new centrifugal concentrating device which promises well. The curtailment was not made in ore output but in the smelter production of copper, as it has, under the merger, been reported possible to treat a lower grade of ore at a better profit than formerly. The copper output of the smelters was reduced in 1910 about 15 per cent and the ore output not quite 5 per cent. It has been stated that the Anaconda cost has been as low as $8\frac{1}{2}$ cents per pound and that an average can be easily maintained of 9 cents per pound. The Tuolumne shaft is 1,800 feet in depth and is being sunk to 2,000 feet. Extensive development of several veins in the North Butte property was productive of a large tonnage of first and second class copper ore. Its Speculator shaft was completed to the 2,400 foot level in 1911 and sinking was continued to the 2,800 foot level. The East Butte Pittsmont mine is now the only independent producer in the Butte district, the operators treating at their smelters their own ores and some custom ores. Operations during 1910-11 were largely confined to the Pittsmont mine, where a new body of ore on the 800 foot level was developed to a width of forty feet, averaging better than 10 per cent of copper and four ounces of silver per ton.

The Butte-Superior Company, developing the Black Rock group, has constructed a concentrator at the property for the reduction of the zinc ores contained in the properties owned by the company, having a capacity of 1,000 tons per day, the ore containing very high values in zinc. The shaft on the property is 1,600 feet in depth.

The output of blistered copper in the state in 1910 was 283,078,473 pounds as compared with 314,858,291 pounds in 1909, the state thus again ranks second to Arizona in copper production. The first record of copper production from Montana is for 1868, but the state did not become an important contributor of this metal until 1880. Since that time there has

been a steady and rapid increase in the copper output. To the close of 1910 the state has yielded 5,326,439,393 pounds or 34.83 per cent of the total output of the United States since 1845. In total production the state ranks first and in output for 1910 it ranked second. The Butte district has furnished nearly the entire output of the state. Four copper smelting plants were operated in the state in 1910, the plant of the Colusa-Parrott Mining and Smelting Company at Butte, the smelter of the East Butte Mining Company, the smelter of the Washoe Copper Company at Anaconda, the smelter of the Boston & Montana Copper Company at Great Falls, the American Smelting and Refining Company's smelter at East Helena treating lead, gold and silver ores as a custom plant. In 1910 the Butte district, Silver Bow County, produced about 282,500,000 pounds of copper or about 26 per cent of the total output of the country. The presence of copper minerals in the state has been known since the discovery of gold in 1864 and attempts were made to treat the ores as early as 1866. But it was not until the late late seventies that the state began to attract attention as a copper producing state and large production did not begin until a railroad reached the district in 1881. To the close of 1910 the Butte district has produced about 5,315,000,000 pounds of copper, or 34.75 per cent of the total output of the country since 1845. In total production and in the output for 1910 it ranks first among the copper producing states of the United States.

COMPENSATION FOR QUARTZ MINE ACCIDENTS.

In addition to the comments which have been made on the proposed compensation act there are some general considerations which deserve attention. It is to be borne in mind that steps taken by the working men throughout the state for uniform legislation of this character have received the approval of all the wage earners in the state, and the suggested measure bids fair to receive favorable attention from the legislative body which is to convene in the near future. It is the desire to establish a general principle under which compensation for death and injury may be justly meted out for the protection of the operative or his family. This new principle is not one that must be essentially restricted to the quartz mining industry, although it is natural enough that it should have its beginning here. A body of men comprising the working forces

of an industry may be described as an industrial army, comparable to an army of soldiers under the protection of the United States, and should receive a compensation. So also is every incident to the maintenance of labor which includes the defense against destitution in the event of any sacrifice of life or limb to the cause of industry. And the industry is expected to defray the cost of the worker's life and accidents, using the state as the mediator. The dangers of the industry are admitted and no man knoweth whose turn will be next. A mine disaster may be sufficient to wipe out the assets of the owner if adequate compensation to the injured and the legatees of the dead should fall upon him and as an inevitable consequence damage suits are bitterly fought. Beyond the constitutional power of the measure to deprive an injured workman of the right of recourse to the courts, the only result which can be secured is that of making a private suit a declaration of forfeiture of the compensation provided by law. On the other hand there exists the laxity in the enforcement of safety provisions. If this state would enact a law governing such compensation, the adoption of such a measure will make all the more necessary inspection acts of a more rigid character.

RIGID DISCIPLINE NEEDED IN MINES.

In the elimination of the causes of accidents in mines the proposed factor is the most difficult to contend with. No matter how many laws for the promotion of safety in mines each mining state may enact, the mines will be no safer than before unless the officials and the men are acquainted with the intent and letter of these laws and obey them or are made to obey them to the letter. For general safety it is difficult to frame laws that will provide for every contingency which may arise. It is desirable for the safety of all that the men employed in mines be experienced men. They only can be depended on to obey the laws which are enacted for their own safety and the safety of their fellows and that they have intelligence enough and have sufficient understanding of their responsibility to take precautions against accidents, even though they may not be specified in the statutes. Probably most of the men holding positions of responsibility in the operation of our mines can be depended on to obey the laws and cope with emergencies on their own responsibility. The great danger lies in the acts of ignorant and irresponsible laborers and miners

who take unnecessary risks in defiance of law and common sense. Educating this class of men to be careful and law abiding is practically out of the question, as far as the majority of them are concerned. If men of this class must be employed the only way to keep them from menacing the lives of the entire underground force is to keep them continually under competent supervision. It is only by a rigid system of discipline that any approach to safety can be guaranteed in mines where death and disaster may follow an apparently insignificant act of thoughtlessness.

REGULATION OF MINE VENTILATION.

Whether a mine is ventilated mechanically or naturally, we are of the opinion that no determinable amount of gas should be allowed in mine air. Statistics show that forty-seven deaths from gas occurred in the United States during the year. If the air is properly distributed between the working places the gas is very slight. Mechanical distribution of the air is, in fact, a necessity for every form of systematic ventilation to assist natural means by keeping the proper openings to all portions of the mine, because air cannot travel without the proper openings are maintained and unobstructed. Although we are agreed upon the desirability of interfering as little as possible with the arrangements which individual mines may select for complying with the legal requirements for ventilating and recognize that the strict enforcement of the maximum for gas will secure a reasonable degree of purity in the mine air, we therefore think it necessary to make provisions for the systematic ventilation of metalliferous mines so that the results of occasional sampling of the air should afford a reliable indication of the general condition of the air in the mine. Hitherto there was no systematic arrangement for ventilating metalliferous mines in the state. Until recently the question of air supply was never taken into consideration when mines were being opened and at a shallow depth they had been allowed to ventilate themselves as best they could. All the details of systematic ventilation, such as regulating doors, stopings, crossings, etc., are therefore conspicuous by their absence. Indeed the first essential for the utilization of regulating devices is the existence of an air current moving in an invariable direction, a condition which, as already pointed out, does not always exist in mines dependent upon unassisted ventilation for their sup-

ply of air. We are of the opinion that the majority of mines will be able to reduce the ventilation below the maximum of a comparatively small cost which will be repaid by increased efficiency of underground labor. As all regulating arrangements depend upon the fresh air taking one defined course and the foul air returning another equally defined course, it is necessary that in every mine possessing two shafts steps be taken to keep one shaft permanently downcast. This can be accomplished by either the erection of high stacks over the upcast or by the use of large fans, both not very expensive devices. At other times a connection with adjoining mines may be sufficient for the purpose. There are in addition certain sections of a mine which are outside the circuit of natural ventilation and in which change of air is effected by slow diffusion into the adjoining sections of the mine and by the supply of fresh air from the drill exhaust. Such sections are between the shafts and the lateral boundaries of a mine where there are no connection with adjacent mines or below the levels of such connections, and more especially the section between the upcast shaft and the lateral boundary. Many unconnected levels, back stopes and areas below the lowest connections between downcast and upcast shafts come within this category. In all such sections the use of mechanical appliances is indispensable for adequate ventilation. It is further necessary that the current from the downcast shall conduct pure air only and shall be split at every level where work is carried on in proportion to the requirements of the level. This is effected in all mines by means of regulating doors, the use of which should be made compulsory in every metalliferous mine. In order to utilize effectively the current of fresh air the courses of pure supply and foul return air must be kept distinct by bratticing or otherwise and short circuiting prevented as far as possible.

THE USE OF COMPRESSED AIR FOR VENTILATION PURPOSES.

The air set free from the rock drill is without doubt a most useful addition to the stock of air in the mine and is liberated where it is most wanted, at the place where the men are working. In going into the matter of ventilating with one superintendent he said plainly that he was afraid to go into the cost of ventilating in this manner knowing that it would seem out of all proportion to the results obtained from the compressed

air system. The reason given for using the compressed air in spite of its admitted high cost is that it is so convenient, the pipes having necessarily to be laid through all parts of the mine faces that are in operation and the hose pipes for the drills being available at any time for blowing out smoke. My contention was that the cheapest system of ventilating is by natural or mechanical ventilation in any system of mining. Many working miners hold the belief that air from the compressed air mains is inferior for breathing purposes to air sent in by other means, there being a common impression that the air has been in some way injured by compression. Tests, however, show that the compressed air carries a small, but measurable, quantity of very finely divided oil, and it is possible that at times this may be abnormally increased and become objectionable. The air in passing through the rock drills often receives a still further charge of atomized oil, as oil has to be used very freely in the drills to keep them in good running order. Besides the oil in the air there is also, however, at times a very offensive odor, probably due to organic matter in the pipes when they are laid, the composition used in making the joints, the finely divided oil from the compressor and dust in the air compressed. The moisture in the air compressed is often incompletely condensed before the air enters the pipe system and therefore condenses in the pipes, and lying in low parts of the pipe line it may become very foul and offensive. On several occasions this offensive smell has been encountered and they could not use the compressed air for a time until it had been blown off for some minutes. The objection of the miners to compressed air on this account is therefore occasionally well founded. There was a striking case of combustion of oil in a compressed air installation resulting in two men being killed and four others barely escaping with their lives. Oil had gathered in the pipe from the compressor to the receiver and in the latter and the compressor had become heated to such an extent that the oil deposit carried on through the pipes to the men working underground, who appear to have been depending on the compressed air supply. The cause of such accidents ascribing them to leakages of the highly heated compressed air back to the intake side of the pistons causing progressive heating, shows the possibility of a temperature fully sufficient to produce gas from the oil lubricant and to

cause it to burn, creating excessive heat and an increased development of gas. Such heating is only possible in single stage compressors where the air is compressed to a high degree in one stroke and may be avoided by the employment of multiple stage compression and inter-cooling. A large quantity of carbonized material was taken out of the pipe leading to the receiver after the accident. These cases show that though this sort of accident is rare, yet it is one that requires to be guarded against. The fumes sent through an air main in which a carbonaceous deposit was burning would necessarily be very poisonous, especially if delivered into a poorly ventilated place.

POLITICS AND MINE INSPECTIONS.

The selection of State Mine Inspectors by popular vote must be stopped if there is to be a reduction of mine accidents in the coal and metal mines of the United States, according to a statement made before the students of Case School of Applied Science, in Cleveland, Ohio, by Dr. Joseph A. Holmes, Director of the Federal Bureau of Mines. The State Mine Inspectors should have permanence in office and freedom from political and other outside influences. Their selection and continuance in office should depend upon their training and experience. They should be examined by a non-political board of mining men. They should be appointed upon the recommendation of such a board, from the applicants that have shown the highest skill and best experience. Under no circumstances should they be selected by popular vote. In other words, politics should have nothing whatever to do with their selection or their continuance in office. The inspectors should have better support in the way of compensation. In fact, the salary of the inspector should be such as to enable the state to secure the best type of men for this most important work.

DANGERS OF ELECTRIC WIRES AND HOW TO AVOID THEM.

Electric wires used for power purposes in mines are dangerous to human life and should always be approached with caution. Deaths occur every year from electric shocks, and yet in most cases these accidents could have been avoided if proper care had been used to prevent contact with the wires. Some men, accustomed to working near electric wires, grow careless, and it is largely because of this carelessness and a lack of

knowledge of the danger involved that so many deaths from electric shocks occur. Special precautions are necessary in mines even where low or medium voltages are used. Everybody knows that high voltage wires carrying 1,000 volts or more are dangerous and such wires are carefully avoided. But many think that circuits carrying only a few hundred volts are not dangerous. This is a serious mistake, because many deaths from electric shock occur from pressures of 300 volts or less. A considerable number of deaths have occurred from contact with circuits of less than 200 volts. Electric circuits in mines are, as a rule, more dangerous to life than similar circuits above ground. This is sometimes due to the lack of space, which increases the liability of contact with the wires, but mainly to the damp condition of most mines. Men have frequently been killed by coming in contact with a circuit that they have often handled without harm because, owing to different conditions of the ground or insulation of the circuit, or to a different manner of contact with the wire, the circuit is more dangerous at some times and in some places than in others. Especial care should be taken not to touch wires when standing on an iron rail or in water, as the danger is usually greater under such conditions. All power wires in mines, of whatever voltage, should be regarded as dangerous and avoided whenever possible. Insulated wires should be avoided as carefully as bare wires. Under the conditions that exist in many of the mines of the state the insulating covering of the wires becomes practically worthless as a protection from electric shock. Defective insulation cannot be always be detected by inspection even by an expert electrician, and an insulation that appears perfectly good to the eye may be defective and if touched a severe or perhaps fatal shock may occur. Even lead covered cables should be avoided because unless the lead sheath be thoroughly grounded, which is often not the case, a shock may be received. Special attention is called to the danger of carrying metal tools, such as drills, picks, shovels, etc., in roadways in which there are live electric wires. It is difficult to carry such tools in the limited space afforded by roadways without permitting them to come in contact with the wires. When a person holds such a tool and permits it to come in contact with a live wire the result is generally much more dangerous than if he had touched the wire directly with his

hand because of the fact that if he has a firm grip on the tool there is a better contact with the circuit. A large proportion of the deaths due to electric shocks in mines result from carrying tools along roadways where there are exposed wires. The practice of carrying tools should therefore be avoided whenever possible, and when it becomes necessary to do so the greatest care should be taken to keep the tools clear of the wires. Powder should never be permitted to come near electric wires of any kind. The slightest contact of the powder with the wire may often result in an explosion. Never try to remove a wire that is found lying about or across the roadway or working places until authorized to do so by the mine electrician or some responsible person. The wire may be a live one and dangerous. Electricity is a very useful agent in mining as in other industries. Used for hauling ore, lighting and hoisting, signalling and other purposes, it is of great value and decreases the cost of mining, if it is properly handled and the wires are kept properly covered and avoided by those not authorized to handle the same.

SOME SUGGESTIONS.

The following suggestions, given below, will help to lessen the number of electric accidents.

Suggestions to Foremen.

Do not allow the men to ride electric locomotives.

Do not allow inexperienced men to handle electric wires.

Do not fail to protect the trolley wires at cross-overs and partings.

Do not allow wires to be installed in a slipshod manner.

Do not fail to have wires promptly repaired.

No not allow explosives to be carried in cars near the locomotive.

Suggestions for Miners.

Do not think that it is smart to get an electric shock. Every time a man gets a shock it shows that he has been lacking in care or knowledge.

Do not be ashamed to be careful. You owe this not only to yourselves but to others who may follow your example.

Do not handle wires or electric apparatus of any kind unless you are told to do so.

Do not carry tools on your shoulders when crossing under the trolley wires or when traveling on the same level.

Do not get your explosives near electric wires.

Do not allow packages of explosives to come in contact with metal parts of cars.

Do not carry explosives in cars near the locomotive.

Do not fail to report when you find that electric wires are down.

Do not install temporary lights. Leave that work to the electrician.

OPENING MINE LEVELS.

It is now considered good practice to open mine levels 150 or 200 feet apart, the distance being measured on the vein. In earlier years the distance seldom exceeded 100 feet and was often less, which proved to be a much better system than the one now in practice for economical mining, it not being so difficult to ventilate the mine by the close level system and for cheap handling of the material in the mine. It is obviously less expensive to open and equip eight levels than twelve in going down a distance of 1,200 feet at one time. But taking into consideration the inconvenience of the high raises to be put through from level to level and the expense of repairing chutes and manways, the close connections have the best of the argument from all points in mining.

MINE HOISTING SIGNALS CODE.

One of the most responsible positions at a mine is that of hoisting engineer. All through the shifts, night or day, the engineer stands at his place, his hand always on the lever, his ear constantly alert for a signal. For him to be negligent or asleep at his post, even for a moment, might bring death to half a hundred or more men and disaster to the property. It is therefore well that every mine, big or little, that operates a hoist, whether it be a bucket or a double compartment, two-decked cage, should use the State Code of Signals and follow this absolutely. This code should be as familiar to the hoisting engineer, the foreman, shift boss and other responsible men of the mine, as the alphabet. By insisting upon the code of mine signals being posted on all levels in a mine and strictly obeyed, the mine management not only largely prevents hoisting accidents but determines upon whom falls the duty of imparting the signal code and making sure that it is known by the men who must use it.

SAFE USE OF EXPLOSIVES.

An examination of the causes of mine accidents shows many of them to be due to the use of explosives. Explosives, however, cannot be justly blamed for this. The true cause lies, in nearly all cases, in carelessness on the part of the users or in their ignorance of the proper methods of handling, loading and firing explosives. The manufacture of explosives has been developed to a high state and there are numerous safe explosives on the market of both low and high grades. Some are practically full proof, at least their makers claim them to be, and others are more sensitive, especially those containing nitro-glycerine. In the handling of explosives the safest plan is always to go on the supposition that all are dangerous. Until this can be impressed on the minds of all users of explosives, accidents will continue to occur. Among the more important causes of accidents from explosives may be mentioned the following: Carelessness in thawing dynamite, carelessness in loading and tamping, misfired, delayed detonation, etc. Thawing of dynamite is not a dangerous operation if conducted properly. Nitro-glycerine explosives solidify when cooled below 45 degrees, F., and while frozen are unfit for use. They should be thawed slowly at a temperature of about 120 degrees F., and never over 130 degrees. The thawing of powder before a fire or in ovens is practically certain to result in disaster. Many lives have paid the penalty for such action. To avoid premature explosions while loading blast holes care should be taken in ramming the charge never to use iron or steel tamping bars or anything that can possibly give a spark when struck against a stone, after the detonator is in place, nor should more than a light pressure be used as a heavy blow may cause detonation. Delayed detonation catches a man every little while. The prevention of such occurrences is first to make sure that the hole is properly loaded and primed and that the fuse is in perfect condition, and further, the scene of the blast should not be visited until ample time has passed to make reasonably sure that no spark is smoldering in the fuse of an unexploded charge. Failure to observe this precaution is a frequent cause of injury and death. Accidents from explosives are all the more lamentable because they are, in most cases, avoidable. The knowledge of a few simple precautions and the exercise of a little common sense are the surest guarantees of safety.

ACCIDENTS IN THE USE OF EXPLOSIVES.

In regard to the provisions, or rather reductions, of accidents in the storage of explosives it is of the utmost importance not to keep blasting caps or electric fuse in the same magazine or place with the explosives. If anything happens to them when kept separately the damage is as a rule small. On the other hand, if kept with explosives and anything happens to them the result is often a disastrous explosion involving loss of life and great property damage. This rule should be rigidly enforced at all times. The insertion of blasting caps and the making of primers in the same room in which dynamite is being thawed has undoubtedly been the cause of several bad accidents. The observance of a few simple precautions should prevent practically all possibility of accident. In thawing explosives always keep the cartridges lying on their sides heating slowly at a temperature not to exceed 80 to 85 degrees F., the lower temperature being the best. Always keep the dynamite in good condition. Take all possible precautions to prevent overheating by electricity or steam and never place the powder directly above the source of heat, and lastly, never keep blasting caps or electric fuse in the thawing house. Since the introduction of low freezing dynamite there has been a marked diminution of accidents from thawing. In the United States, during the year 1906, two years before the introduction of the first low freezing dynamite, there were reported 64 accidents from thawing dynamite against 28 in 1910, the year in which low freezing dynamite was on the market. This class of accidents is interesting in that it offers more chances for mitigating its dangers and more promise of returns from educating the consumers than any other. A method of thawing, often found at places where more than a case per day is used, is a box or house with a steam coil on the floor over which the dynamite is supported by slats or boards. This method offers an excellent opportunity for the nitro-glycerine to exude if the temperature becomes unduly high and for it to drop on the hot iron pipe. It has been a generally accepted theory that when nitro-glycerine is dropped from a height of a foot or so on a hot metallic surface it will explode. The danger is greater with high grade straight dynamite than with gelatine or ammonia dynamites. The improper making of primers claims a few victims every year. While making primers the taking of

naked lights into a magazine should be absolutely prohibited, as a spark or a drop of hot candle grease falling on the detonator under these conditions rarely fails to cause a serious accident.

ACCIDENTS.

The accidents during the year are somewhat of a peculiar nature. Special attention has been given to the investigation of these accidents, which I will comment on for a short time. The greater number of accidents in mines during my tenure of office are of that character which might have been, in my judgment, avoided by the exercise of sound judgment and more caution. Where portions of a mine are dangerous to life and limb it is the duty of the superintendent or foreman to select for such places experienced, cautious miners, possessed of a disposition which makes safety the first consideration. In adopting such a rule in places where skill and caution are required, various managers will give some proof of their much asserted desire to avoid accidents. The mines of this state seem to be reasonably provided with safeguards to life and limb. The conviction is forced on me that if human life was given its rightful first consideration and earnest, intelligent efforts were made to reduce fatalities, it could be done by applying the means already at hand. All material and appliances to make safe conditions are supplied, timbers are furnished without stint, the powder is thawed and distributed, and in most of the mines the shafts, guides, safety apparatus and cages are regularly examined and tested. The cage tenders have full charge of the cage and bell lines and are the only persons who are authorized to give signals directly to the engineers. The hoisting equipments are marvels of power and mechanism, the engineers are selected for their skill and experience, and yet, in spite of all these seemingly perfect arrangement, many accidents happen. The prevention of accidents by falling rock and explosions are largely dependent on the caution exercised by the individual. Constant exposure to the risks incident to their calling makes the miners very trustful, and in some instances accidents from these sources can be traced to failure to employ temporary devices for present safety. Some of the serious cases would warrant the belief that the engineers in charge were not altogether blameless. No doubt exists in my mind regarding the responsibility of the

victims in majority of accidents, but have the mine officials done their full duty? I fear the causes which operate to make the miners careless may have infected some officials as well, but perhaps in a less degree. The safe and economical handling of large bodies of men requires the adoption of a set of strict rules and regulations aside from any law now in force. Absolute obedience to such rules should be exacted from employees and ready compliance can be had if the proper means are used for their enforcement. The duty of the superintendent does not cease when he has furnished the means of safety and issued instructions. He should see that the one is properly used and the other implicitly obeyed and in no instance should he allow the subordinate officials to jeopardize the safety of those in his charge in vain efforts for self reputation. Any subordinate official who will not obey the instructions in enforcing the rules for safety should be removed from his position, and when the foreman or superintendent does not discharge men who will not obey rules for safety the law should provide means for their removal. As long as there are human beings on earth there will be accidents due to the failure of individuals to do the right thing at the right time. The coming of a time when men will have reached such a state of control over their mental and physical actions that they can be relied upon at all times and under all circumstances not to make a mistake is hardly to be hoped for. The best we can expect is to become so well trained as to greatly reduce the chances for making mistakes that may result in accidents. Much attention is at the present time being directed to utilizing means for minimizing industrial accidents. This is especially true in the mining industry. There has been much loss of life among mine employees that might have been prevented. Part of these accidents have been due to defective mechanical equipment or to improved methods of operation. But far greater than these is the factor of individual ignorance and carelessness on the part of some of the mine employees.

During the years 1911-1912 notices recommending the following were issued and were generally complied with:

In reference to timbering	16
In reference to places for storing powder	9
In reference to quantity of explosives in magazine	12
In reference to storing inflammable materials in houses or buildings covering the mouths of tunnels	9
In reference to apparatus for thawing powder	10
In reference to employing cage tenders who should have exclusive charge of cages in shafts	9
In reference to defective safety clutches on cages	8
In reference to defective hoisting cables	6
In reference to escapement shafts	10
In reference to number of men who ride on skips and cages	6
Forbidding riding on loaded cages, skips and buckets	13
In reference to the use of State Mining Signals	15
As to the gates when lowering and hoisting men	9
For providing better ventilation	18
Providing tunnels with separate connections to the surface for escape	8
As to leaving pillars of ground to protect shafts	9
Regarding the rate of speed in lowering and hoisting men	12
Regarding repairing and putting in ladders	18
In reference to cross-heads	8
To provide railings around shafts, winzes and manways	20
In reference to finger boards	14
Regarding bulkheads prohibiting damming of water in mines	6
In reference to filling of stopes to prevent caves	15

During the year ending November 30th, 1911, there were,

Mines inspected	270
Men employed in mining	14,000
Fatal accidents	46
Percentage of fatal accidents to each 1,000 men employed	3.28
Non-fatal accidents	20
Percentage of non-fatal accidents to each 1,000 men employed	1.21

To the number of men employed as above stated, five hundred may be conservatively added, which would include the scattered prospectors who are working their own claims, to cover those employed by small operators who are employing from two to five men, and also leasers, which would make a total of 14,500 men employed during the year.

Number and Causes of Accidents.

The following table shows the number of fatal accidents and their several causes occurring during the year ending November 30th, 1911:

Premature blasts or explosions	11
Fall of ground	10
By cages in shafts	9
Falling from bucket in shaft	2
Falling down ore chutes	4
Falling down manways	4
Suffocated by gas or foul air	3
Falling down raise	1

Caught by fretting ore chute	1
By being crushed under ore car	1
Total fatal accidents during the year	46

Number and Causes of Non-Fatal Accidents.

The following table shows the number of non-fatal accidents, with their causes, during the year ending November 30th, 1911:

Fall of rock or cave of ground	11
Premature blasts and explosions	3
Injured by falling timbers	2
By being caught by mine car	2
By falling down manway	1
By being struck by cage	1
Total non-fatal accidents for the year	20

During the year ending November 30th, 1912, there were,

Mines inspected	278
Men employed	14,500
Fatal accidents	47
Percentage of fatal accidents to each 1,000 men employed	3.21
Non-fatal accidents	25
Per-centage of non-fatal accidents to each 1,000 men employed	1.31

To the number of men employed as above stated, five hundred may be conservatively added, which would include scattered prospectors who are working their own claims and would also cover those employed by small operators employing from two to five men, and also the leasers, which would make a total of 15,000 men employed during the year.

Number and Causes of Accidents.

The following tables shows the number of fatal accidents and their several causes occurring during the year ending November 30th, 1912.:

Premature blasts or explosions	4
Fall of rock or ground	27
By cages in shafts	3
Falling down ore chutes	3
Falling down manways and shafts	4
Died of heart failure in mine	1
Falling down raise	1
Being crushed under ore car	1
Caught by filling ore chute	1
By coming in contact with electric wires	2
Total fatal accidents during the year	47

Number and Causes of Non-Fatal Accidents.

The following table shows the number of non-fatal accidents with their causes during the year ending November 30th, 1912:

Fall of rock or cave of ground	15
Premature blasts or explosions	2
Injured by falling timbers	1

By a splintered guide in shaft	1
By falling down manway	3
By being struck by cage in shaft	3
Total non-fatal accidents for the year	25

Mines Inspected, Men Employed, Accidents and Percentages.

The following table gives the number of mines inspected, the number of men employed and the fatal and non-fatal accidents in the metalliferous mines during the past twenty years:

Year.....	Mines Inspected.....	Men employed.....	Fatal accidents.....	Non-fatal accidents.....	Total accidents.....	Percentage of fatal accidents per 1,000 men employed.....
1893	56	6,312	29	4	33	6.45
1894	78	7,082	21	19	40	2.81
1895	88	8,758	41	19	59	4.67
1896	78	7,727	64	21	85	8.28
1897	130	9,825	52	29	81	5.20
1898	136	11,096	48	29	77	4.32
1899	165	12,316	49	32	81	3.97
1900	163	13,996	47	35	82	3.26
1901	157	12,078	35	33	68	3.00
1902	169	13,784	47	45	92	3.41
1903	168	14,175	39	50	89	2.74
1904	176	14,480	41	55	96	2.82
1905	186	14,680	48	41	89	2.83
1906	190	15,000	52	43	95	3.20
1907	290	15,000	42	21	63	2.70
1908	280	14,500	21	17	38	1.32
1909	280	14,500	47	31	78	3.00
1910	280	14,000	51	30	81	3.60
1911	270	14,000	46	20	66	3.28
1912	278	14,500	47	25	72	3.21

To the men employed for 1912 may be added five hundred who are scattered over the state working their own prospects and those employed as leasers and employed in small mines, making a grand total of 14,500 men employed during the year.

FATAL ACCIDENTS, THEIR NATURE AND WHERE OCCURRING, FOR THE YEAR, 1911.

DATE.	NAME.	COUNTY.	MINE.	CAUSES.
Jan. 18	Harry Abbott	Broadwater	Keating	By an explosion of powder in mine.
	Dan White	Broadwater	Keating	By an explosion of powder in mine.
	Dan Ryan	Broadwater	Keating	By an explosion of powder in mine.
	Louis Tucker	Broadwater	Keating	By an explosion of powder in mine.
June 27	Percy May	Broadwater	Keating	By a fall of ground in mine.
Dec. 15	Steve Surman	Lewis and	Bald Mountain	By falling in ore chute in mine.
Jan. 14	John Naukins	Silver Bow	Diamond	Suffocated by gas in mine.
Jan. 15	James Carney	Silver Bow	Diamond	Suffocated by gas in mine.
Jan. 26	Michael Tahza	Silver Bow	High Ore	By a fall of ground.
Feb. 3	George Haidene	Silver Bow	Mountain View	By falling off cage in shaft.
Apr. 8	John Neville	Silver Bow	Balaklava	By falling down a raise.
Apr. 22	Peter Petta	Silver Bow	Gagnon	By a fall of ground.
May 8	Dan O'Neil	Silver Bow	Neversweat	By a fall of ground.
May 10	William Davis	Silver Bow	West Colusa	While tapping an ore chute.
May 25	Oscar Kavtse	Silver Bow	Mountain Con	By premature blast.
May 25	Aren Seisth	Silver Bow	Tramway	By a fall of ground.
June 7	James McAlvin	Silver Bow	Badget	By a premature blast.
July 13	John Wilson	Silver Bow	Elmorlu	By a premature blast.
July 16	Paul Tolonen	Silver Bow	Speculator	By falling down manway.
July 17	Michael Joye	Silver Bow	Neversweat	By falling down manway.
Aug. 8	Michael Sullivan	Silver Bow	Neversweat	By a fall of ground.
Aug. 11	William Leecross	Silver Bow	Diamond	By falling down timber chute.
Aug. 17	John Carr	Silver Bow	Tonolomne	By a fall of ground.
Aug. 28	John Harrington	Silver Bow	Leonard	By falling down manway.
Aug. 28	Frank Cantrich	Silver Bow	Speculator	Killed in shaft, struck by a rail.
Aug. 31	Richard Dunstch	Silver Bow	Black Rock	By riding on drill cage in shaft.
Sept. 3	Louis Cheone	Silver Bow	Black Rock	By riding on drill cage in shaft.
	Patrick O'Neill	Silver Bow	Black Rock	By riding on drill cage in shaft.
	Dennis Shea	Silver Bow	Black Rock	By riding on drill cage in shaft.
	Chas. L. Green	Silver Bow	Black Rock	By riding on drill cage in shaft.
	Dan Sheehan	Silver Bow	Black Rock	By riding on drill cage in shaft.
Sept. 7	James J. Lee	Silver Bow	Black Rock	By not having gates closed on cage.
Sept. 7	August Marona	Silver Bow	Anaconda	By a fall of ground.
Sept. 8	Edwards Myers	Silver Bow	Kadger	By a premature blast.
Sept. 8	James Moka	Silver Bow	West Stewart	Suffocated by gas.
Sept. 13	Willia McGinnis	Silver Bow	Neversweat	By falling down manway.
Sept. 22	James Pepporitch	Silver Bow	Original	By a fall of ground.
Sept. 30	Henry Cassidy	Silver Bow	Gagnon	By being crushed under ore car.
Oct. 1	Frank Dwan	Silver Bow	Diamond	By falling down a chute.
Oct. 16	Richard Lennon	Silver Bow	Speculator	By caught by freeeling an ore chute.
Oct. 18	Con Harrington	Silver Bow	St. Lawrence	

FATAL ACCIDENTS, THEIR NATURE AND WHERE OCCURRING, FOR THE YEAR 1911.—(Continued).

DATE.	NAME.	COUNTY.	MINE.	CAUSES.
Oct. 2	Fred Server	Silver Bow	Speculator	By a premature blast.
Nov. 3	John Shonimitor ..	Silver Bow	Helehan	By falling off bucket in shaft.
Nov. 8	Gilbish Lazzari	Silver Bow	Leonard	Struck by a rock in shaft.
Oct. 13	John Williams	Silver Bow	Buffalo	By a fall of ground in stope.
Nov. 10	Wilbur Cook	Chouteau	August	By falling down shaft.
Nov. 15	Joseph Curran	Silver Bow	Black Rock	By a fall of ground.
Nov. 21	John Naughton	Silver Bow	Mountain Con.	By a fall of ground.

NON-FATAL ACCIDENTS, THEIR NATURE AND WHERE OCCURRING FOR THE YEAR 1911.

DATE.	NAME.	COUNTY.	MINE.	CAUSES.
Dec. 18	Rade Zarich	Jefferson	Golden Curry	Injured by a premature blast.
Jan. 18	Al Westlake	Broadwater	Keating	By an explosion of powder. Leg broken.
	John Russell	Broadwater	Keating	By an explosion of powder. Arm broken.
Dec. 21	Charles Duggan	Silver Bow	West Gray Rock	By a fall of ground. Arm hurt.
Mar. 13	John Stephens	Silver Bow	Buffalo	Leg broken by a fall of ground.
Mar. 22	Mike Leno	Silver Bow	Mountain Con.	Leg broken by a fall of ground.
Mar. 22	J. H. Ray	Silver Bow	Tramway	Slightly injured by moving timbers.
Mar. 26	Robert Winn	Silver Bow	Belmont	Injured by being struck by cage.
Apr. 11	John Mackey	Silver Bow	Gagnon	Leg broken by fall of ground.
Apr. 28	John Laka	Silver Bow	Leonard	Leg broken by fall of ground.
May 7	Chas. Britton	Silver Bow	West Stewart	Injured by falling down manway.
June 30	Mike Combo	Silver Bow	St. Lawrence	Injured by car. Ribs broken.
July 7	John Newton	Silver Bow	Speculator	Leg broken by a fall of ground.
July 28	Peter Miller	Silver Bow	Speculator	Leg broken by a fall of ground.
Aug. 4	Mike Harkins	Silver Bow	Speculator	Leg broken by a fall of ground.
Sept. 2	John Murphy	Silver Bow	Speculator	Leg broken by a fall of ground.
Sept. 12	Thomas Burns	Silver Bow	Speculator	Leg broken by a fall of ground.
Oct. 28	George Lynch	Silver Bow	Speculator	Leg broken by a fall of ground.

FATAL ACCIDENTS, THEIR NATURE AND WHERE OCCURRING FOR THE YEAR 1912.

DATE.	NAME.	COUNTY.	MINE.	CAUSES.
Feb. 1	Charles Fitten	Broadwater	Martha Washington	Fall of ground in stope.
Dec. 10	Henry Morley	Silver Bow	Pittsmt	Fall of ground in stope.
Dec. 12	W. J. Kelly	Silver Bow	Silver Bow Mine	Fall of ground.
Dec. 16	Frank Maurich	Silver Bow	St. Lawrence	Fall of ground.
Dec. 23	Wm. Murray	Silver Bow	West Colusa	Falling down manway.
Dec. 24	W. McCormack	Silver Bow	St. Lawrence	Electric shock in shaft.
Jan. 1	Kalle Jonston	Silver Bow	Leonard	Fall of ground in stope.
Jan. 7	Andrew Holoren	Silver Bow	Speculator	Fall of ground.
Jan. 17	Mike Lahan	Silver Bow	Original	Fall of ground.
Jan. 22	Toney Teden	Silver Bow	Tuolumne	Fall of ground.
Jan. 27	Cornelius Kelly	Silver Bow	Diamond	Falling in ore chute.
Feb. 11	Fred Jhorston	Silver Bow	Ball Mine	Fall of ground.
Feb. 14	John C. Murphy	Silver Bow	Silver Bow	Premature blast.
Feb. 12	W. P. Sullivan	Silver Bow	Silver Bow	Premature blast.
Feb. 17	James Doyle	Silver Bow	Diamond	Fall of ground.
Feb. 17	Uno. Veletto	Silver Bow	High Ore	Heart Failure.
Mar. 5	Uno. Gust	Silver Bow	Mountain View	Fall of ground.
Mar. 18	H. Swanson	Silver Bow	Neversweat	Fall of ground in stope.
Mar. 21	John Hay	Silver Bow	Badger	Premature blast.
Apr. 10	H. Kolo	Silver Bow	St. Lawrence	Fall of ground.
Apr. 15	Henry Daxter	Silver Bow	West Colusa	Falling down an open stope.
Apr. 21	Uno. Givando	Silver Bow	Mountain Con.	Falling in ore chute.
Apr. 29	Oliver Germain	Silver Bow	High Ore	Fall of ground.
Apr. 22	Dennis Byrnes	Silver Bow	High Ore	Fall of ground.
June 15	David Freeman	Silver Bow	St. Lawrence	Fall of ground.
June 29	Albert Quirk	Silver Bow	West Gray Rock	Fall of ground.
July 3	Simo Vucanovich	Silver Bow	Mountain Co.	Fall of ground.
July 13	Fred Kelly	Silver Bow	Speculator	Smothered by run from ore chute.
July 13	Risney Eval	Silver Bow	West Stewart	Crushed by mine car against post.
Aug. 8	Wm. Martin	Silver Bow	Diamond	Falling of cage in shaft.
Aug. 16	Henry Fitzpatrick	Silver Bow	High Ore	Killed by descending cage in shaft.
Aug. 16	August Carlson	Silver Bow	Mountain Con	Falling of ground in stope.
Aug. 16	Nick Vuyovich	Silver Bow	Moonlight	Falling down timber slide.
Aug. 20	Gus. Hamburg	Silver Bow	West Gray Rock	Rock coming down manway.
Aug. 24	J. W. Gorman	Silver Bow	Speculator	Fall of ground.
Aug. 26	Albert Wonston	Silver Bow	Leonard	Coming in contact with live trolley wire.
Sept. 20	H. Hagan	Silver Bow	Speculator	Striking head against trolley wire.
Sept. 24	G. Walkalo	Silver Bow	Leonard	Fall of ground in stope.
Oct. 4	Matthew Roberts	Silver Bow	East Colusa	Fall of ground.

FATAL ACCIDENTS, THEIR NATURE AND WHERE OCCURRING FOR THE YEAR 1912.—(Continued).

DATE.	NAME.	COUNTY.	MINE.	CAUSES.
Oct. 5	Jas. Tanning	Silver Bow	Badger	Fall of ground.
Oct. 9	Steve Daneeich ..	Silver Bow	Leonard	Fall of ground.
Oct. 17	Harry Thrush	Silver Bow	High Ore	Falling down manway.
Oct. 28	Parney Manion	Silver Bow	High Ore	Fall of ground.
Oct. 30	James Triper	Silver Bow	Original	Falling down shaft.
Nov. 2	Peter Osterman	Silver Bow	Neversweat	Fall of ground.
Nov. 6	John Popovich	Silver Bow	Balaklava	Cage in shaft.
Nov. 8	John Walsh	Silver Bow	St. Lawrence	Premature blast.
Nov. 22	R. Vesnejo	Silver Bow	West Stewart ..	Struck by cage in shaft.

NON-FATAL ACCIDENTS, THEIR NATURE AND WHERE OCCURRING FOR THE YEAR 1912.

DATE.	NAME.	COUNTY.	MINE.	CAUSES.
July 26	Clarence Hanfield ..	Jefferson	Golden Curry	Arm broken by fall of ground.
Dec. 9	Al Kalonen	Silver Bow	Speculator	Back injured by fall of ground.
Dec. 21	Frank Cook	Silver Bow	Speculator	Arm fractured by fall of rock.
Dec. 22	Jno. Sullivan	Silver Bow	St. Lawrence	Hand crushed by fall of rock.
Dec. 28	Mike Hayes	Silver Bow	Gagnon	Leg injured by fall of rock.
Jan. 12	James Muller	Silver Bow	St. Lawrence	Leg broken by fall of ground.
Jan. 20	Peter Ostermich	Silver Bow	Diamond	Leg broken by fall of ground.
Feb. 1	T. P. Harrington	Silver Bow	Speculator	Injured by being struck with gate on cage.
Feb. 6	Brech Helks	Silver Bow	Mountain Con.	Injured by splintered guide in shaft.
Apr. 20	Frank Gilling	Silver Bow	West Colusa	Arm injured by cage in shaft.
June 18	Patrick Burns	Silver Bow	Modoc	Leg broken by cage in shaft.
June 24	Jno. Maroney	Silver Bow	Bell Mine	Leg broken by falling through floor in slope.
July 1	Frank Carroll	Silver Bow	West Gray Rock	Face badly lacerated by premature blast.
July 16	Thomas McGrath	Silver Bow	West Gray Rock	Face badly lacerated by premature blast.
July 25	Geo. Anglish	Silver Bow	West Colusa	Leg broken by fall of ground.
Aug. 18	Jas. Fitzwilliams	Silver Bow	Leonard	Leg broken by fall of rock on sill.
Sept. 13	Jas. Stefan	Silver Bow	Mountain Con.	Leg broken by fall of ground.
Oct. 12	Mat Kynken	Silver Bow	Mountain Con.	Eye injured by premature blast.
Oct. 30	James Dunlevy	Silver Bow	High Ore	Leg broken by a fall of ground.
Nov. 8	Ernest Tonio	Silver Bow	Mountain Con.	Arm injured by falling in ore chute.
Nov. 13	John Loroney	Silver Bow	Bell Mine	Arm broken by falling in ore chute.
Nov. 13	John Kane	Silver Bow	Mountain Con.	Arm injured by a fall of ground.
Nov. 13	John Willis	Silver Bow	Anaconda	Arm injured by a fall of ground.
Nov. 15	August Willis	Silver Bow	Anaconda	Arm injured by a fall of ground.
Nov. 15	Dan Haggerty	Silver Bow	Badger	Head injured by fall of ground.
Nov. 15	John Murphy	Silver Bow	Badger	Head injured by fall of ground.

MINERAL OUTPUT OF THE UNITED STATES.

As nearly as can be estimated the mineral and metal production of the United States for 1911 was valued at \$2,075,000,000. There are a number of mines figures of the products of which were not completed, but we believe that our estimate will be found not far from the final returns. An idea of the magnitude and growth of the mineral industry in the United States may be had by perusing the accompanying table, which gives the values of the production for the years 1883 to 1911, both inclusive:

Year.	Production. Total.	Increase Annual	Decrease. Annual	Percentage.
1883	\$ 446,859,742.00	\$.....	\$ 5,041,686.00	1.1
1884	406,110,405.00	.....	40,749,068.00	9.1
1885	418,803,180.00	12,692,775.00	.....	3.1
1886	433,137,994.00	15,334,804.00	.....	3.7
1887	508,387,674.00	74,249,680.00	.....	17.1
1888	524,624,536.00	16,236,862.00	.....	3.2
1889	531,392,513.00	6,767,977.00	.....	1.3
1890	606,476,380.00	75,083,867.00	.....	14.1
1891	605,385,029.00	.....	1,091,361.00	.2
1892	622,543,381.00	17,158,252.00	.....	2.8
1893	543,693,967.00	.....	78,849,414.00	12.7
1894	549,374,763.00	5,680,800.00	.....	1.1
1895	640,771,528.00	91,396,769.00	.....	16.6
1896	640,544,221.00	.....	227,307.00	.1
1897	646,992,582.00	6,448,361.00	.....	1.0
1898	724,278,854.00	77,286,272.00	.....	11.9
1899	1,014,335,705.00	209,076,851.00	.....	40.1
1900	1,107,020,352.00	92,664,647.00	.....	3.1
1901	1,142,000,029.00	34,979,677.00	.....	3.1
1902	1,323,102,717.00	181,102,688.00	.....	15.9
1903	1,491,928,980.00	118,826,263.00	.....	12.8
1904	1,361,067,554.00	.....	130,861,426.00	8.8
1905	1,623,928,720.00	262,861,166.00	.....	19.3
1906	1,902,517,565.00	278,588,845.00	.....	17.1
1907	2,087,119,999.00	184,602,434.00	.....	9.7
1908	2,052,187,879.00	.....	34,932,120.00	12.7
1909	1,886,772,843.00	.....	165,415,036.00	10.8
1910	2,003,744,869.00	116,972,026.00	.....	6.1
1911	2,075,000,000.00	71,255,131.00	.....	3.5

It is worthy of remark that the mineral output of this country has been multiplied nearly five times during the last twenty-five years. In 1909 the United States led the world in the production of coal, copper, lead, petroleum, natural gas, pig iron and many minor metals and minerals and was second in gold output to the Transvaal and second in silver to Mexico. Reviewing the mining industry we find that no other country has equalled the creditable record that has been maintained by Montana during the last quarter of a century.

MINE OUTPUT OF METALS IN THE STATE, 1911, BY COUNTIES—U. S. GEOLOGICAL SURVEY.

COUNTY.	Gold—Placer.....	Gold—Deep Mine.....	Silver—Fine Ounces..	Copper—Pounds.....	Lead—Pounds.....	Zinc—Pounds.....	Total Value.....
Beaverhead	\$ 1,455	\$ 43,400	102,864	137,577	830,572	.....	\$153,946
Broadwater	5,123	600,519	13,387	140,558	149,276	.....	627,024
Cascade .....	.....	2,774	99,855	5,314	861,613	.....	95,118
Chouteau	60	423,759	48,519	.....	.....	.....	469,551
Deer Lodge	285	66,998	73,842	7,463	.....	.....	107,352
Fergus	66	358,515	8,676	.....	17,446	75,995	368,296
Gallatin	424	.....	1	.....	.....	.....	425
Granite	2,584	136,856	350,852	.....	80,679	.....	331,100
Jefferson	4,318	91,776	823,704	161,719	2,088,236	.....	646,843
Lewis and Clarke	26,728	231,757	57,402	7,402	116,146	.....	295,156
Lincoln	3,788	5,209	15,032	.....	816,211	.....	53,693
Madison	584,948	275,441	102,357	25,533	225,116	.....	927,374
Meagher	38	89	32	10,892	12,514	.....	2,098
Missoula	20,335	14,500	2,388	.....	28,976	.....	37,571
Park	2,235	575	264	.....	29,866	.....	4,294
Powell	23,343	36,772	25,659	41,468	110,796	.....	83,883
Ravalli	2,836	854	959	24,372	22,372	.....	6,177
Sanders .....	.....	229	870	14,958	22,150	.....	3,557
Silver Bow	6,175	735,730	10,258,122	272,271,171	1,017,273	43,734,150	42,741,229

MONTANA'S MINERAL OUTPUT.

Year.	Gold.	Silver.	Copper.	Lead.	Total.
1890	\$3,300,000	\$20,360,636	\$16,665,473	\$ 675,392	\$40,095,465
1891	2,890,000	20,139,394	14,377,336	1,229,027	38,635,757
1892	2,891,386	22,432,323	19,105,646	990,035	45,419,208
1893	3,576,000	21,858,780	16,360,958	964,089	43,029,827
1894	3,651,410	16,575,458	17,233,718	730,551	38,191,137
1895	4,327,040	22,886,992	21,114,869	754,360	49,083,261
1896	4,380,671	20,324,877	25,356,541	670,010	50,732,099
1897	4,496,431	21,730,710	26,798,915	928,619	53,954,675
1898	5,274,913	19,159,482	26,102,616	809,056	51,310,067
1899	4,819,157	21,786,835	40,941,906	909,340	68,457,338
1900	4,736,225	18,334,443	39,827,135	701,156	63,746,727
1901	4,802,717	18,334,443	36,751,837	498,622	60,387,619
1902	4,400,095	17,622,285	24,606,038	332,749	46,961,167
1903	3,590,516	17,097,702	28,200,632	387,445	50,276,335
1904	5,097,786	18,887,227	36,410,301	195,525	60,590,848
1905	4,889,234	7,991,705	48,165,277	227,160	70,677,583
1906	4,469,014	8,027,027	56,105,288	254,390	68,855,764
1907	3,286,212	6,149,619	57,945,000	275,500	67,646,230
1908	3,057,640	5,488,785	45,195,000	265,400	54,006,820
1909	3,791,510	6,436,931	40,567,541	128,287	51,429,694
1910	3,730,486	6,567,942	36,170,686	180,677	*48,358,253

*Total includes \$1,708,462 zinc production.

PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC IN MONTANA, BY COUNTIES, IN 1910.

County.	Gold.	Silver.	Copper.	Lead.	Zinc.
Beaverhead	\$ 57,105	\$ 27,890	\$ 7,533	\$ 12,05	.....
Broadwater	321,955	11,600	15,865	10,821	.....
Cascade	2,170	30,812	2,339	13,134	.....
Chouteau	408,315	80,716	.....	.....	.....
Deer Lodge	135,809	50,160	52,534	.....	.....
Flathead	40,317	500,121	.....	300	.....
Granite	80,443	166,548	2,396	1,158	.....
Jefferson	133,709	555,972	15,508	86,922	.....
Lewis & Clark ..	190,903	31,803	547	8,663	.....
Madison	810,699	61,169	4,973	10,716	.....
Meagher	1,729	300	500	.....	.....
Park	800	300	.....	900	.....
Ravalli	3,000	1,100	.....	1,800	.....
Missoula	39,011	4,322	.....	4,071	.....
Powell	42,719	8,630	10,130	2,114	.....
Sanders	2,000	3,000	4,000	11,835	.....
Lincoln	5,948	1,863	.....	6,175	.....
Fergus	636,752	5,013	148	2,651	972
Silver Bow	765,155	5,616,454	36,101,637	15,408	1,707,490

**PRODUCTION OF PRINCIPAL METALS AND NON-METALIC MINERALS
IN THE UNITED STATES.**

	1910.	1911.
Gold—Value	\$ 96,055,214	\$ 96,233,528
Silver—Ounces	56,438,695	57,796,117
Copper—Pounds	1,081,925,963	1,091,600,000
Lead—Short Tons	379,333	384,000
Antimonial Lead	14,069	13,195
Spelter—Short Tons	250,479	273,807
Tungsten—Short Tons	1,824	1,125
Quicksilver—Flasks	20,937	21,821
Aluminum—Pounds	12,000,000	15,000,000
Pig Iron—Long Tons	27,303,567	23,500,000
Portland Cement—Bbls.	80,000,000	80,000,000
Petroleum—Bbls.	217,000,000	217,000,000

PLACER MINING.

It is difficult to obtain an accurate statement of the gross product of gold for the state for any particular year or period of years, owing to the way in which it is obtained, its nature and the different methods in which it is disposed of. The placer yield of the state since the discoveries of 1862 has run into the millions, most of which drifted into channels that financially found use for it without credit having been given to the placer miner. In this state during 1911 and 1912, especially in the vicinity of Virginia City, Madison County, several new discoveries have been made and three large electric dredges have been placed in operation for the recovery of values contained in the several gravel beds owned by the Conrey Placer Company. In Lewis and Clark County several gravel beds are in operation employing the system of sluicing. The gravel beds of Ten Mile have been bonded to eastern capitalists and several tests have been made with the view of installing dredges. In the operation six hundred acres have been secured by the company which have shown operating values in the tests. The French Bar Company, operating in Missoula County, on the head of Cedar Creek, has built one of the largest dredges in the state, doing away with the old system of sluicing, which will effect a greater saving of the fine gold contained in the gravel of the district. The Cherry Creek Placer Mining Company, in the Snowshoe district in Lincoln County, has begun operations. The company owns one thousand acres of placer ground and has practically an unlimited quantity of gravel which runs very high to the yard in gold, several cleanups having been made during the season. There were three hydraulic plants in operation in the Libby district

during the year and several others in contemplation. The Allen Gold Mining Company is operating two placer mines in Deer Lodge County, one by a steam derrick, hydraulic mining and sluicing, using hydraulic pressure in operations. The properties have been worked extensively and the returns have been exceedingly large. The Butte & Georgetown Mining and Milling Company has completed several land deals in the several gulches, whereby it becomes the possessor of more than one thousand acres of placer ground in the vicinity of Anaconda. About seven hundred acres of this ground is in California Gulch, two hundred acres are located in Lost Creek and about one hundred and sixty acres are in Mill Creek. There are many known rich deposits of placer gravel within the state that are dry and so situated that water cannot be taken to them without great expense, and these are lying idle waiting the perfection of a practical machine that will extract both the fine and coarse gold with certain and ample profits to the owners.

BEAVERHEAD COUNTY.

The mineral possibilities of this county are extensive in area. The mineral zones lying on the east and west of the Big Hole river are highly mineralized. A great deal of superficial development has been done, enough to demonstrate the fact that complete and deep development is fully warranted. The principal districts are the Wing, Bannack and Elkhorn, in all of which ore has been discovered in paying quantities.

Watams Mine.

This mine, under John McCoy, foreman, employs 16 men. It has some very rich ore which runs as high as \$500.00 per ton, but being in small veins it is very hard to work.

New Departure.

Is at present being worked by leasers and there are about six men working, but the company intends in early spring to resume operations.

Heckla Mine.

This mine until recently has been shut down for several years with the exception of a few leasers. Recently it has been taken over by the Longmaids of Helena, who are going to do a great deal of work. They are at present installing an electric power line from the Big Hole Power Company. This mine, in the early days, was one of the large producers of the state, having paid over a million dollars in dividends. This property was worked on a small scale in recent years, owing to the expense of fuel, but now that they have electric power development will be pushed on a larger scale.

Ingersoll Mine.

Philip Lonergan, superintendent. Work is being pushed through a tunnel, six men being employed. Is located in the Blue Wing district. In early days it was a silver producer of some merit and they expect to do a lot of work during the coming year.

BROADWATER COUNTY.

The most active district in the county was Radersburg, owing to the construction of a branch line of railroad from Three Forks to the Keating property, a distance of thirty miles. This has aroused capital and has caused great activity throughout the entire district, some five or six new companies having en-

tered the field. The immense tonnage of low grade ore which could not be mined and shipped by wagon will now be mined at a profit. The companies are all active in the development of the camp the majority of them having encountered shipping ores containing high gold values. Some of the principal properties are the Keating, Black Friday and the Ohio-Keating which has attained a depth of 700 feet. The Great Falls Power Co., has constructed an electric branch line from Boulder to the camp, a distance of fifteen miles, which has electrified the entire district, eliminating the heavy cost of transportation of coal for operating purposes, stimulating the entire district. The prediction is that Radersburg will be the largest gold producer in the entire state in the near future.

The Keating Gold Mining Co.

The Keating Gold Mining Co. is operating the Keating and Blacker group of claims situated in the Radersburg district, under the supervision of E. M. Greaves, the property being developed through two shafts, 800 and 400 feet respectively, the 800 being an incline which has been equipped with electric power throughout, the power being furnished by the Missouri River Power Co. The power effects a great saving in the operation of the property. The property has been extensively developed during the year, 2,000 feet having been accomplished. The shaft has been sunk to the 800-foot level where development of the vein at that point has been steadily going on. Developing and placing the ore bodies in shape for extraction has been the principal work in the property during the year, awaiting railroad transportation. The company employs 100 men.

The Black Friday.

The Black Friday group, located southwest of Radersburg and operated by the Black Friday Gold Mining Co., under the management of A. B. Bennett, employs 35 men on the property. The property has been extensively developed during the year on the 4 and 5 levels, extending the levels on the strike which developed new ore bodies carrying high values. The vein has been developed a distance of 1,400 feet showing a well defined vein and a continuous ore body carrying gold values. An entire new plant has been installed, electricity being used, making an up-to-date plant throughout.

Ohio Keating.

The property, owned and operated by the Ohio-Keating Gold Mining Co., is situated west of the Keating Mine. Some very extensive improvements have been made during the year, the plant having been electrified throughout. The shaft has been put down to over 300 feet, 100 feet having been sunk during the year and the vein cut at that depth which has been developed a distance of 200 feet showing a well defined vein carrying gold values. The property has been under the management of John H. Miles, employing 25 men.

Ironage Mine.

The Ironage property is located in the Winston district. The property has been taken over recently by C. H. Muffley. Machinery has been installed and the mine has been unwatered to a depth of 700 feet and all necessary repairs made in the mine for future operation. The shaft, an incline, has been equipped with a steam hoist of sufficient H. P. for the present depth. The mine, when operated, paid several hundred thousand dollars in dividends. The values are gold of a free milling character. Several shipments which have been recently made show the property to be on a paying basis. The vein being very flat requires to be filled and closely timbered to protect the hanging wall.

Green Horn Mine.

The Greenhorn property located in the Radersburg district is operated by the Greenhorn Gold Mining Co. An inclined shaft has been put down in the property to a depth of 200 feet, 100 feet having been sunk during the year. Driving on the vein north and south for developing purposes has been continuous and the extraction of ore, regular shipments having been made, show high values in gold.

Little Giant Group.

This group is situated in the Hassel Mining District and is operated by the Little Giant Gold Mining Co., under the management of T. E. Whitehead. Operations are conducted through a series of tunnels having reached a length of 650 and 1,400 feet respectively, cutting the vein several hundred feet in depth. The veins, as far as developed, show a true fissure carrying gold as the chief value. During the developing of this group several thousands of tons of ore have been stored on the dump, pending the proper system of recovering the values contained

in the ore, which is being thoroughly tested by the management. The property has been developed extensively during the year, some 700 feet having been accomplished, connections having been made to surface for ventilation and escape.

The John L. Mine.

The property known as the John L. is situated at Hassel and operations are conducted through a series of tunnels they having reached a length of 500 and 700 feet respectively on the vein. The vein is a true, persistent fissure. The gangue is an altered granite carrying a sulphide in character, containing silver, lead and copper of which several car loads are shipped monthly to the East Helena smelter. The mine has all the indications of permanency with depth. A lower tunnel is in contemplation which will tap the vein at a much greater depth, proving the continuity of the ore body. The property is owned by M. J. Cavanaugh & Co.

East Pacific Mine.

The East Pacific Mine, owned by Robert A. Bell, was operated by the East Pacific Gold Mining Co. during 1911. Work on the mine was suspended pending settlement of some difficulty which arose in the development of the mine. The property has been extensively developed by tunnels averaging from 200 to 1,800 feet in length. The first class ore is a high grade Galena carrying gold and silver of about equal values. When in operation 20 men were employed.

Little Olgia.

This property consists of three patented claims owned by Kleinschmidt of Helena. A tunnel 600 feet in length has been driven on the properties for development purposes cutting several veins crossing the country, six men being employed in the work under way.

Barnetta Group.

The Barnetta group of claims are operated by the Barnetta Gold Mining Co. The property is operated by a two compartment shaft which was sunk to a depth of 300 feet during the year. The developing of the veins at that point will be continuous to ascertain the permanency of the ore bodies, the values being principally gold and the country formation being Diarite. The veins are true, persistent fissures and strike north and south. The property is under the management of John Rowett and employs 18 men.

Keystone Mine.

The Keystone group, situated in Johnny's Gulch, four miles south of Radersburg, has been taken over by the Summit Gold Mining Co., of which T. W. Parker is Superintendent, and is employing 16 men in the operation of a shaft and tunnel. The tunnel has reached a length of 700 feet on the vein showing a well defined fissure vein carrying heavy iron oxide, showing high values in gold. The shaft will be sunk to a depth of 300 feet lower than the tunnel level for the purpose of determining the extent of the values contained in the ore body.

Martha W.

The Martha W. property, operated by J. S. Smith of Helena, is located in the Winston district. A two compartment shaft has been put down to the 300-foot level. The vein has been explored north and south of the shaft for a length of 400 feet on the vein. The ore is sulphide in character, silver-lead being the principal values, the vein being a true fissure in granite. The plant is equipped with a steam hoist. The property is under the management of B. Adamson and employs 25 men.

Rena Mine.

The Rena property is operated by the Rena Gold Mining Co., of which C. H. Donaldson is the General Manager and Emory Cupples the Foreman. An incline shaft was sunk on the property to a depth of 300 feet of which 100 feet was accomplished in 1911. The veins have been fully explored a distance of 600 feet on the bottom level. The ore secured is an iron oxide carrying good values in gold and copper. During the development on the south a large body of water was cut in the vein which could not be handled by the present equipment and caused the shutting down of the property. The company is contemplating the sinking of a much larger shaft so as to install much larger machinery of sufficient power for the handling of the flow of water. The new shaft will be put down to the five hundred feet.

The Republic.

The Republic group, owned by the May Day Mining Co., is located two miles south of Radersburg. G. A. Winslow is the Superintendent. A two compartment shaft has been put down to a depth of 200 feet to explore the vein at that depth to ascertain its continuance and the values contained at that

point, the values being principally gold, which is the principle value of the camp. The property is electrically equipped.

Highland Mary.

The Highland Mary group, located in Johnny's Gulch, four miles south of Radersburg, is operated by the Butte & Radersburg Mining Co. The sinking of a two-compartment shaft to a depth of 200 feet has been accomplished during the year. Development of the vein at that point to a length of several hundred feet has been accomplished showing a distinct fissure carrying gold values. The property is equipped with a gasoline hoist of sufficient power for 400 feet. The property is under the supervision of Richard Grythall and employs 12 men.

Cynosure Group.

This group owned and operated by J. J. Goodman, located 9 miles south of Winston. The property has been opened by tunnels which have been driven a length of 250 and 300 feet on the strike of the vein exposing several ore chutes carrying high values in gold. Regular shipments are made to East Helena.

The V. Dandy Group.

This group of claims is situated in the Winston district and has been developed very extensively during the year for the purpose of determining the extent of the ore body. The property has been opened by several tunnels driven for exploring purposes, 600 feet having been accomplished. The property is owned by C. H. Clark of St. Louis, Peter Rees being in charge and employing 8 men in the operations.

BLAINE COUNTY.

Blaine County was created by an act passed by the last legislature, having been taken from Chouteau County and embraces that portion of the mineral zone called the Little Rockies, where mining has gone steadily forward. New discoveries have been made and new companies launched for the development of the several important districts. The new ventures will in time be the equals of mines now producing in these districts. The portion of the country embracing Peoples Creek and Landusky has been active during the year, several promising prospects having been opened up. The August group and the Alder Gulch groups are steady producers, both plants having been active during the year.

Shellrock Group.

This group of claims is owned by the Ruby Gulch Gold mining Co. Development work on the group has been the driving of tunnels to ascertain the extent of the ore bodies, 300 feet having been accomplished. The ore is cyanide in character, that being characteristic of the country. Values are principally gold. The ore will be reduced in the company's mill at the Ruby property, one mile from this property.

The Fergus Mining Company.

This property comprises a group of thirteen claims, situated on the north side of the Little Rockies on People's Creek. Operations are conducted by tunneling, several tunnels having been driven a distance of 400 feet, in which are developed several large ore bodies which have been tested and found to be of a cyaniding gold in character. There is ample water on the property for mill purposes. The property is under the supervision of J. W. Williams.

The August Gold Mining Company.

The August Gold Mining Co's. properties consist of eleven claims situated at Landusky, the property being developed through a series of tunnels ranging in length from 200 to 800 feet, the various tunnels being connected to surface for ventilation and exit in case of accident. During the year a shaft has been put down to a depth of 200 feet below the lowest workings and the vein explored a distance of 200 feet on the strike, showing a well defined ore body. In the near future the mill and cyanide plant will be constructed in the vicinity of the mine eliminating the heavy expense of transportation, a distance of two miles, where the plant was constructed by the former owners. The plant, when in operation, employs from 40 to 50 men. The mill is at present in operation treating the tailings from the present workings, extracting from 85 to 90 per cent of the values, which are principally gold. The property is under the management of L. A. McCandless.

The 96 Mine.

This property is situated on Dry Beaver, three miles north of the Alder Gulch mines and is owned by the Beaver Creek Mining Co. The property is opened by a series of tunnels ranging in length from 200 to 700 feet. The work having been done on the strike of the vein shows some very extensive ore bodies of a cyaniding character, carrying gold.

The Rawhide Mine.

This property is located on the extension of the Alder Gulch property to the east. A tunnel 400 feet in length has been driven on the vein. Some of the ore being of a sufficiently high grade, has been shipped. The property has been developed extensively on the vein to ascertain the continuity of the ore bodies which are of a cyaniding character. The formation is lime and porphyry.

The Ruby Gulch Mining Company.

The Ruby Gulch properties are situated at Zortman and consist of a group of seventeen claims. The property has undergone a vast amount of improvement during the past two years electric power having been installed throughout the entire plant. The lower tunnel has been driven from the Independence claim to connect with the Ruby, a distance of 2,700 feet, which will tap the ore body 200 feet below the lowest workings. The ore is conveyed by electric tram to the mill, which is on the same level and which has greatly reduced the cost of transportation, also being very beneficial for ventilation purposes. The development of the mine is kept well ahead of the stoping. The plant is operated to its capacity of 300 tons per day. The property is under the management of M. I. Leydig, J. E. Cavanaugh being the Superintendent and employs sixty men.

CASCADE COUNTY.

Because of the low price of silver and of other metals the progress and development of Nelhart and vicinity has been checked for several years. The district has had a great deal of activity during the present year several new companies having been launched for the development of the district and several reduction plants are in contemplation for the reduction of the various ores contained in the district. In the Benton district the Ripple and Big Seven mining companies have been steady producers. Several new and promising strikes have been made on the divide between Cascade and Meagher counties, showing copper.

The Hartley Mine.

The Hartley property has been developed through a tunnel that has reached a length of 1,000 feet, five hundred feet being a crosscut in the country vein a true fissure carrying silver,

lead values. A shaft has been sunk 200 feet below the tunnel workings opening some very extensive bodies of ore. The property has recently been retimbered and made secure, it being operated for a short period by a party of leasers. The property is owned by William Muller.

The Florence Mine.

This property is located immediately in the Neihart district and has been taken over by the Florence Mining & Milling Co. The upper portion of the mine is operated by tunnels that are respectively 1,100 and 1,050 feet, each of these affording 150 feet level through the ore bodies. A shaft has been sunk to a depth of 400 feet below the lowest tunnel which has been unwatered by the new company. An additional 100 feet has been sunk and development of the country at that depth has been carried on to ascertain the continuity of the ore bodies. If the development justifies, a three compartment shaft will be put down to a depth of 700 feet in the near future. The property is under the management of W. T. Smith, Daniel Lenny being the Superintendent, and employs twenty men in the operations. All precautions are taken to protect the men employed.

The Dakota Group.

The Dakota group consists of three claims situated in the Neihart district, which have been taken over by Charles Whitcomb & Co., who are doing very extensive development on the property. It has been opened by a series of tunnels ranging in length from 300 to 500 feet respectively, on the vein, showing a well defined fissure carrying high values in silver, lead and zinc. The lower tunnel will be developed further to determine the extent of the ore bodies at a much greater depth. A zinc plant and concentrator will be erected on the property for the reduction of the mine output. The property is under the supervision of George Powers and employs twenty men in the operations.

Liberty Group.

The Liberty group of claims is located in the Barker district and is operated by the Montana Mining Co., of which S. M. Roberts is the manager and employs eight men in the development which is conducted through a series of tunnels which have been driven 300 and 400 feet respectively, on the vein, showing a well defined fissure, carrying lead, silver and a small

percentage of copper in the vein filling. A concentrator is in contemplation for the reduction of the mine output.

Big Seven Mine.

The Big Seven has been developed extensively during the year under the management of David Barker, the lower tunnel having reached a length of 1,200 feet, 700 feet on the strike of the vein, showing a well defined vein, carrying high values in gold and silver, the tunnel cutting the ore body 700 feet in depth. Machine drills are used. In the operations for developing purposes twelve men are employed.

The Marguerite Mine.

This property is located two miles north of Neihart and is operated through a tunnel that has been driven to a length of 300 feet on the vein and several shipments of ore have been made. A second tunnel is in course of construction to cut the vein at a greater depth. The ore is a lead, silver in character, which runs very high. The property is owned by Frank Linquist, who is manager.

The Barker Mine.

This property is situated in the Barker district. Operations are conducted by the Barker Mining Co., of which C. N. Loring is Superintendent, and William Campbell, Foreman. Sixty men are employed. In the operations a vast amount of exploring has been done during the year, 1,100 feet having been accomplished, the shaft having been put down to the four hundred-foot level and equipped with a steam hoist. Cages are used in the operations with all safety appliances attached. A concentrator has been constructed for the reduction of the mine output, of a one hundred ton capacity. The vein has been developed several hundred feet, showing some very extensive ore bodies, carrying lead, silver and copper. All necessary openings have been made to the surface for ventilation.

The Black Diamond.

This property, owned by the Black Diamond Mining Co., is situated on Snowshoe Creek, seven miles north of Neihart. The operations are through a tunnel that has been extended into the mountain a length of 1,100 feet cutting several veins of concentrating ore of silver and lead in character. A fifty-ton concentrator has been erected for the reduction of the mine output. The property has been extensively developed on the vein. It is under the supervision of Paul Rohel.

The Fitzpatrick Mine.

This property is situated east of Neihart and operations are carried on through a tunnel that has reached a length of 750 feet. 450 feet have been driven on the vein east and west, showing an extensive ore body of a silver character. The property is operated by Robert Ford. All necessary escapes and exits to the surface have been provided which makes the ventilation excellent.

The Lexington Mine.

This property is located on the west end of the Big Seven and is operated by a party of leasers and regular shipments to the silver smelter are made. Prospecting and developing are carried on extensively to ascertain the extent of the ore bodies. The property is owned by the Pearson & Harrison Co. The tunnel has reached a length of 700 feet.

The Ripple Group.

The Ripple group of claims is situated on Snowshoe Creek. During the past two years a tunnel has been driven lower down the mountain to attain a much greater depth, and has reached a length of 1,300 feet, 700 feet on the strike of the vein, several high grade ore bodies having been uncovered. Connections are made to surface for ventilation and escape, it being 200 feet vertically between tunnels. The property is owned and operated by J. C. C. Barker and employs sixteen men. Because of the gold values contained the property is considered one of the most likely in the district.

Snowdrift Group.

The Snowdrift group of claims situated in the Snow district were in operation during 1911. Operations ceased during this year. Operations were through a series of tunnels, 250 and 900 feet in length respectively. Connections are made between the various levels to the surface which furnish ample ventilation and means of escape in case of necessity. Several short crosscut tunnels tapped the ore body at various depths. Several shipments have been made carrying high values in lead and silver. The property was under the supervision of Daniel Lenny and employed ten men.

DEER LODGE COUNTY.

Mining in Deer Lodge county has been very active and the development which has been done gives evidence of some extensive mineral deposits with every indication of permanency in the Cable, Southern Cross and Georgetown districts. The Southern Cross mine has been extensively developed and large bodies of ore have been explored. The entire district has all the indications of developing a very prosperous mining center. In the near future it will be one of the greatest gold mining districts in the state, owing to the railroad transportation.

The Southern Cross.

The Southern Cross property, located in the Georgetown district, has been taken over by the Anaconda Co., which contemplates very extensive development in the property. It has been developed to a depth of 400 feet on the various levels and large ore reserves have been uncovered. The shaft has been sunk an additional 200 feet, making 600 feet to the lowest workings. The deeper levels are extensively developed to meet the extensive shipments which will take place on the completion of the railroad. The property is maintained in a safe condition under the supervision of T. H. Allen and employs thirty-five men.

The Iron Mask.

This property is owned by L. T. Ireland. A tunnel has been driven on the property for developing purposes which has reached a length of 300 feet on the vein to determine the extent of the ore body. The country formation is lime with porphyry vein filling, carrying gold. The property has been properly timbered as far as developed.

The Montana Mine.

The Montana property is located in the Georgetown district and is owned by John Ducie of Anaconda. The property has been developed to a depth of 120 feet showing a well defined ore body carrying gold, the vein being an oxide of iron in character. The equipment consists of a plant of sufficient power for the depth attained.

The Venice Mine.

The Venice property is situated at the Gold Coin of which L. T. Ireland is Superintendent. The principal work is driving a tunnel that has reached a length of 1,200 feet, 300 feet of

which were driven during the year. The principal object is to intersect the several veins known to exist in the properties owned by the company, all of which are gold bearing, the work being conducted in a safe manner.

The Fotheringay Mine.

This property is situated in the Georgetown district and is owned by the Gold Coin Mining Co. and is under the supervision of L. T. Ireland. Operations are conducted through a series of tunnels that have been driven into the mountain to intersect the vein a distance of 200 and 500 feet respectively. The vein shows free gold which has been developed to the extent of a hundred feet east where ore extraction has been carried on. The work has been properly timbered as far as developed.

The Venezuela Mine.

The Venezuela property is being developed by George Masten by an incline shaft that has reached a depth of 100 feet developing the vein at that depth, showing a well defined ore body, carrying high values in gold. The ore is an iron oxide in character.

The Minnaha.

The Minnaha group has been developed by Mike Brennan & Co. A tunnel has been driven on the property to a length of 250 feet in which some very extensive ore bodies have been developed showing commercial values in gold. The ore is an iron oxide in character. The property is in the vicinity of the Southern Cross.

The Trilby.

The Trilby group are under lease to H. H. Nelson & Co., who are developing the group through a 400-foot tunnel on the strike of the vein. Some very extensive ore bodies of an iron oxide have been opened in the development, carrying commercial values in gold. The tunnel will be continued on the strike to prove the continuity of the ore bodies.

Holdfast Mine.

The Holdfast property is operated by Robert Limburg under lease and employs ten men. The property has been developed to a depth of 170 feet through a shaft put down in the vein, 500 feet of development having been done at that point. Several large ore reserves are at present discovered in the proper-

ty. The ore is an iron oxide in character carrying gold values. The property is situated in the Georgetown district and is owned by the Frank Estate.

The Baltic.

The Baltic property is located in the Georgetown district. The claims are developed by a shaft having been sunk to a depth of 100 feet in the vein, which shows a well defined ore body of an iron oxide in character carrying high values in gold. The property is equipped with a gasoline hoist, is under the management of Mell Lenehan and employs eight men.

The Duplex Group.

The Duplex group consists of four claims situated in the vicinity of the Southern Cross, which have been developed through a tunnel driven across the country which will prove the extent and value of the entire group. Several veins have been developed which show a very promising ore body as far as developed, showing free gold in the vein material. The property has been extensively developed during the year, 600 feet having been accomplished. It is owned by the Georgetown Gold Mining Co., under the management of Charles Bostrom, William Beck being the foreman.

The Oro Fino Mine.

The Oro Fino is operated by Charles Bostrom & Co. The property is situated in the Georgetown district. Operations are through a perpendicular shaft which has been put down to a depth of 300 feet, exploring the ore body at that point, which is very extensive. During the year 600 feet of developing has been done which developed large ore bodies to the north of the claim. The ore is an oxide of iron, characteristic of the camp, carrying high values in gold and employs twenty men when in operation.

Hidden Lake.

The Hidden Lake Mining Co. are developing a very promising group of six claims in the Hidden Lake district. A tunnel has been extended to a length of 350 feet cutting a well defined ore body. A winze has been put down 50 feet below the tunnel to ascertain the continuity of the veins which show very strong at that depth, carrying high values in gold. The property has all the necessary exits to surface for ventilation and escape. The property is under the management of R. R. Robertson and employs ten men.

The Eagle Mine.

This property situated in the Georgetown district, is operated by John Pike & Co. It is being developed by a shaft 75 feet in depth on the vein. The ore is an oxide in character and carries high values in gold, the vein showing a well defined ore body on the strike.

FERGUS COUNTY.

Extended strikes were made in several of the districts during the year. Operations in the New Year and Maiden districts were attended with success. Considerable capital has been invested and several plants have been installed for the reductions of the output of the mines. The Yogo Sapphire Mines were satisfactorily operated and a vast amount of new territory explored. The quality of the stones is equal to any on the market. There was much activity during the year in Cone Butte and Ford Creek districts. Considerable capital has been invested and plans are under way for the installation of necessary plants to treat the products of the mines in those localities.

The New Year Mine.

The New Year group, consisting of eight claims, is operated by the Rheingold Mining Co., of which A. L. Lossinger is the General Manager and is situated in the Judith mountains. The one hundred ton cyanide plant has been increased to a 300 ton plant. They have also installed a ten drill compressor plant and an aerial tramway, over one mile in length, for transporting the ore from the mines to the mill. The company is developing the property, driving several tunnels to determine the extent of the ore bodies. The surface will be mined by the open cut system. The company employs seventy miners.

The Kendall Mine.

This group of mines, situated one mile from the town of Kendall in the North Moccasin mountains, is operated by the Kendall Gold Mining Co. The main shaft has reached a depth of 600 feet. The mine has been equipped with all necessary machinery which, for the most part, is operated with electric power throughout. Development has been carried on extensively during the year, 2,000 feet having been accomplished. The working force has been reduced owing to lack of ore in the developed portion of the mine. The country to the north will be explored in order to determine the extent of the ore

deposits in that section. The mode of timbering is square sets and stulls and the mine is properly provided with means of egress and is well ventilated.

The Cumberland Mine.

This property is situated one mile east of Maiden and has been operated by a party of leasers during the year, John Drinville, acting as General Manager and Superintendent, in charge. A perpendicular shaft, 250 feet in depth, has been cut by a tunnel 900 feet long to convey the ore to the mill which has been erected, with a capacity of 200 tons crusher and rolls and Wilfley tables and a cyanide plant is in connection, which will effect a close saving of the values. A vast amount of development work has been done, principally in the ore zone.

The War Eagle Mine.

The War Eagle property, located two miles south of Maiden, is owned and operated by Burt & Stewart. John Wright is foreman of the property. The property has been opened by two tunnels driven on the vein which are, respectively, 100 and 400 feet in length. The vein is a true fissure and the ore is an iron sulphide carrying lead. Silver and a small percentage of gold, some of the ore being of sufficient high grade to warrant shipping. The property looks very promising as far as developed.

The North Moccasin Mine.

The property, operated by the North Moccasin Mining Co., has a shaft sunk which has reached a depth of 325 feet. The equipment consists of an electric hoist with all safety appliances attached. The mine has not been in operation during the year owing to some disagreement among the owners. The mine is supplied with all necessary escapes to surface and ventilation.

The London Sapphire Company.

This property, situated on Yogo Creek, 40 miles west of Moore, a town on the Milwaukee railroad, is under the supervision of Charles Gladsen with W. A. Danforth, as foreman. Shafts have been sunk to a depth of 100 feet and the material in the same manner as has been followed in metalliferous mining. Heretofore the large part of the material was worked by sluicing, the dyke being worked in places by this means to a depth of 50 feet. The part of the dyke which permitted this kind of mining is about exhausted. The material taken to

surface is allowed to disintegrate before being run through sluice boxes, where the gems are recovered.

The American Sapphire Company.

The property operated by this company is located on Yogo Creek and within three miles of the London company's property. The dyke, carrying the values, has been opened by a tunnel which has been driven a length of 1,300 feet. A shaft has been put down to a depth of 125 feet below the tunnel level for the purpose of exploring the vein or dyke at that point. The mining has been conducted similarly as in metalliferous mines. The dyke is broken and run to chutes and conveyed to a plant which has been erected for the recovery of the stones. The plant is equipped with gigs and revolving screens for the recovery of the values contained in the vein material. H. O. Chowan is Superintendent and employs thirty-five men.

The McGinness Mine.

The McGinness group of mines is under lease to the Gold Reef Mining Co., of which W. A. Young is the General Manager. The property is operated through tunnels, the longest of which is 1,450 feet. The property has been developed to the extents of 9,000 feet from time to time. An exploration shaft has been put down 225 feet below the lowest workings. Developing the ore bodies at that point has been continuous during the year. The old mill has been remodelled so as to effect a greater saving of the values. Cyaniding, concentrating and amalgamating, saving 95 per cent of the values contained in the ores, which are principally gold. The company is making arrangements to extend the workings in the mine and the plant capacity. The mine is in fairly good condition and is well ventilated.

The Golden Eagle Mine.

The Golden Eagle, owned by the Murphy Bros., of New York, is located in the Cone Butte district, seven miles north of Maiden. Operations are conducted through a series of tunnels which have reached a length of 400 and 600 feet respectively, on the vein, which carries gold of a free milling character. A ten stamp mill has been constructed for the reduction of the mines output. The property is under the management of James Murphy.

The Forge Creek Group.

This group consists of fourteen claims situated on Forge Creek, thirty miles north of Lewistown. Operations are conducted by the Forge Creek Gold Mining Co., of which John Lee is the acting manager. The property has been extensively developed during the year by tunnels driven on the vein showing several well defined ore bodies, carrying gold of a cyaniding character. A mill is in course of construction with a capacity of 200 tons.

The Gilt Edge Mine.

The Gilt Edge group is situated at Gilt Edge and has been in operation during 1911-1912 by the Gilt Edge Lease Mine Co., under the management of R. A. Turnbull. Forty men are employed in the extraction of ore which has been treated in the mill situated at the mine, 3,000 tons a month being successfully treated by the cyaniding process. This plant is the third of its kind built in the United States. The principal tonnage is mined on open cuts on the surface during the summer season and mining in the lower portion of the mine during the winter, the underground portion being well protected by timbering.

The Barnes-King Group.

This company's holdings consist of twenty patented claims in the immediate vicinity of Kendall in the North Moccasin mountains and are operated by the Barnes-King Gold Mining Co. The San Diego mine has recently been purchased by the company and will be operated through the Barnes-King shaft. The shaft will be re-timbered and put in shape to handle the increased output of the mine, which will be treated in the mill and cyanide plant owned by the company. The main shaft will be sunk several hundred feet in order to make ore transportation more accessible. There are large ore reserves blocked out in the new property acquired by the company. Re-timbering and repair work are in progress putting the property in shape for more extensive operations under the management of George T. McGee as General Manager and T. W. Heatherly as Foreman, and will employ fifty men.

The Spotted Horse Mine.

This property is located in the Maiden district and has been operated by a party of leasers during the year. The principle work done has been the extraction of ore, under the manage-

ment of Ed Coolidge. The shaft is 400 feet in depth and has been repaired as have also the main workings of the mine so that operations are carried on in a fairly safe manner. A great deal of exploring has been done to open ore bodies for extraction. These bodies carry very high values in gold.

FLATHEAD COUNTY.

The mineral resources of Flathead County are very extensive in area. Several districts in this county afford unequalled inducements to capital for the development of profitable producing mines. The mineral sections of the Flathead Reservation have a showing in gold and silver which are not excelled anywhere and the strong, persistent fissures discovered are promising copper bearing lodes, the formation showing well defined veins in granite formation.

The Okedale Mine.

The property operated by the Okedale Mining Co., of which R. H. Hutchison is the General Manager, is located two miles north of Tava. A tunnel has been extended to a length of 1,000 feet which has intersected several veins in the properties at a depth of 700 feet from the apex of the veins. Driving east and west on the veins is in progress at the present time. The values are principally copper. The works are securely timbered as far as developed under the supervision of John Parks.

The Northern Mine.

The Great Northern Mine is situated one mile north of Tava and is operated by the Great Northern Copper Co. Operations are conducted through a series of tunnels ranging from 200 to 500 feet in length on the strike of the vein. The values contained are principally gold and copper. The property as far as developed is in a fair condition regarding safety. It is under the supervision of W. L. Loyde and employes eight men.

The Leupfer Mine.

This property is situated eight miles west of Whitefish and is operated by the Leupfer Mining Co., of which George Hoffman is Superintendent. Six men are employed. The property has been developed by a shaft which has been put down to a depth of 150 feet. The equipment consists of a steam hoist of sufficient power to attain a depth of 400 feet. The vein has been explored for a distance of 150 feet, showing a well defined

vein in porphyry and lime. The ore is a sulphide and carries copper as its chief value.

The Lippincott Mine.

This group of four claims, situated in the Essex mining district is operated by John Stewart. The property has been developed through a series of tunnels which have reached a length of 200 and 300 feet respectively, on the vein, showing copper of commercial value. A lower tunnel will be extended to a length of 1,000 feet into the mountain to prove the continuity of the ore bodies.

GRANITE COUNTY.

There has been much activity in the various mining sections throughout the county and promising veins have been opened up several of them producing. From the present development the mineral possibilities are great and development is made with practical assurance of success. The old camp of Granite has been inactive during the year furnishing employment to miners engaged in leasing the old workings of the mines. The Granite-Bi-Metallic Co. is operating through the 6,000 foot drainage tunnel, all of the lower portion of the properties. The Royal Basin Mining Co. is developing a very promising copper property on South Bolder. Also the Frisco Co., operating near Philipsburg has installed an excellent plant on the property controlled by them.

The American Flag.

This property, operated by the Modock Copper Co., is situated in the Red Lion district. A shaft has been put down 200 feet. Exploring the country at that depth has been extensively carried on. The claims owned by the company are highly mineralized, showing copper and gold in the iron oxide vein filling. The property is equipped with a gasoline hoist for prospecting purposes.

The Hanna Group.

This property, located in the Red Lion district, has been taken over by W. B. Rogers of Anaconda and is under the supervision of T. W. Gordon. The properties are developed by a 600 foot tunnel and several shafts are sunk on the strike for developing purposes, to ascertain the extent of the ore bodies. The ore is a heavy oxide of iron carrying high values in gold. The company employes eight men.

Badger Gold Mining Company.

The Badger Gold Mining Co. is developing a very promising group in the Red Lion district. A tunnel has been extended to a length of 500 feet cutting country to intersect several known veins in the property, at a considerable depth, which eliminates the handling of water. The properties show some well defined ore bodies carrying gold.

The Hobo Mine.

The property, with this suggestive name, is owned by T. D. Hinds, and is situated one mile east of Philipsburg. It is being operated at present by a party of leasers. A crosscut tunnel has been driven into the mountain, a distance of 2,800 feet, encountering several veins on their strike, which carry high values in silver. There are several prospects being operated under lease in the vicinity, the aggregate tonnage shipped being from 100 to 200 tons per month.

The First Chance Mining Company.

The First Chance Mining Co.'s holdings consist of thirty-two patented claims, located at Garnet, and are owned by Mitchell & Mussigbrod. The properties were worked at intervals in the past year, several thousand tons of ore being shipped to Anaconda for treatment. Several of the claims have been worked successfully by leasers who, in the aggregate, have produced a considerable tonnage of high-grade ore. The lower grades of material are left in the mine and will be treated in the ten stamp mill, which is a part of the property. The mill is equipped with plate amalgamation followed by concentration over vanners and Wilfley tables and tailings and slime from this process are run over a large area of California slime tables and a large percentage of values recovered.

The Gold Reef.

The property operated by the Gold Reef Mining Co. consists of a group of four claims located eight miles up Flint Creek, is under the supervision of W. H. Mader, and when in operation, employs forty men. The property is operated through a series of tunnels, ranging in length from 400 to 725 and 900 feet, and they are connected by an upraise, providing the workings with ample ventilation and escape. The ore is an oxide of iron carrying gold as the principle value. A 50 ton mill and cyanide plant have been installed in connection to reduce the mine's output.

The Nancy Hanks Mine.

The Nancy Hanks has been operated by the Downey Bros. under lease. An incline shaft has been put down on the vein to a depth of 325 feet. There are several working levels from the shaft. The ore is an iron oxide in a lime formation, carrying high gold values. Operations have been discontinued in the lower portion of the mine, the work being confined to surface workings for the present, to locate the permanent ore body.

Crescent Mining Company.

The Crescent Mining Co. is at present confining itself to the systematic and extensive mining of its property which is located on Rock Creek. The operations are conducted through a tunnel, which has reached a length of 1,000 feet, and which will be extended to a length of 1,800 feet to crosscut several known veins in that locality. The work is being done by an Ingersoll compressor. Twelve men are employed at the property which is under the supervision of J. H. Hand.

The Sunday Mine.

The property of the Sunday Mining Co. is situated twelve miles north-east of Princeton and is quite extensively developed, two tunnels being driven on the lode, developing a large tonnage of milling ore. Active work has been under way for sometime on the property putting it in shape to produce a large tonnage. This is anticipation of the erection of a mill. Every possible contingency, in so far as to a loss of values, has been provided for. The work has been confined to a tunnel which has reached a length of 1,200 feet. The property is under the supervision of John Allen.

North Star Group.

The Royal Basin Mining Co. is operating a very promising copper group of claims in Wyman's Gulch, five miles east of Flint station. The property has been opened by a series of tunnels which have been driven to a length of 300 and 500 feet, uncovering large deposits of copper ore. A tunnel is in course of construction which will intersect the vein at a greater depth. All ores are to be gravitated to the mill which has been erected on the property for the reduction of the mine product. The plant has a leaching process in connection. A refining plant is also to be constructed during the year, which will make a complete plant for the reduction of the mine out-

put. The property is under the management of J. D. Fields and employs from 80 to 100 men.

Golden Eagle Mine.

This property, situated in the Red Lion district, is operated by the Allen Gold Mining Co., several tunnels having been driven on the property to a length of 900 to 1,000 feet, cutting several well defined veins, carrying high values in gold of a free milling character. The work has been secure as far as developed.

Grant and Harfort.

This property is located at Garnet and is one of the old locations of the district. It has been taken over by A. P. Peake who has developed it very extensively in connection with the McGone and Anderson group, extending the Harfort tunnel to a length of 1,100 feet where it intersects the Anderson vein at a much greater depth. Some very extensive ore bodies are shown in the development, from which regular shipments are made. The property is maintained in excellent condition under the supervision of James Reynolds, and employs 35 men.

Bi-Metallic Mines.

The old mines of the Granite and Bi-Metallic Mining Co. have been operated by the company during the year after a long period of inaction. The old Granite shaft has been overhauled and repaired for future operations and the entire property will be operated by the company in the future. The old mill and tram are to be put in commission for the reduction of the entire mine output. There are at present 175 men in the property, leasing and those employed by the company and at the same time nothing is wanting in the mine that is necessary to insure the safety of the men, but what is provided, while the mill is a model of its kind.

Frisco Group.

The Montana-Frisco Mining Co. have equipped their property with an up-to-date plant. The equipment consists of a 50 H. P. gasoline hoist and compressor. The 550 foot shaft has been retimbered and equipped with all safety appliances. The 1,100 foot tunnel has been connected which furnishes ample ventilation and exist to surface. The vein has been developed to a length of 700 feet, showing a well defined fissure vein in granite, carrying high values in lead silver in the vein

filling. The property is under the management of Laurence Donlon.

The Dewey.

A shaft has been put down to a depth of 105 feet on the property, equipped with a steam hoist, the vein having been extensively explored at that point some 400 feet having been accomplished opening several chutes of ore, carrying commercial values in gold, from which several shipments have been made.

The Poccahontas.

This property, owned by W. A. Clark, is situated two miles east of Philipsburg and is operated under a lease by James Pattent. A small prospecting shaft has been sunk to a depth of 100 feet, equipped with a gasoline hoist. The vein has been developed a distance of 100 feet, encountering several chutes of high grade ore, carrying as high as five hundred ounces of silver to the ton. The property looks very promising as far as developed.

The John Mitchell.

The John Mitchell group consists of five claims on a direct strike of a persistent fissure vein which has been opened to a length of 1,100 feet on the vein showing a well defined ore body in several places in the vein of a lead-silver in character, from which several car loads have been shipped. The property looks very promising in the breast of the tunnel. The property is owned and operated by Larry Donlon.

The Hope Mining Company.

The property of this company is located at Philipsburg and has been operated for thirty years. Operations on this old property during the last two years have been by leasers confined to prospecting for new ore bodies, driving tunnels and working on pillars of ore left in the stopes of former large ore chutes, occasionally encountering a small chute of ore in the new development in the property.

Modoc Mine.

The Modoc property has been developed by Highland Pritchard. The property is situated in the Red Lion district. Development consists of a shaft 100 feet in depth, drifting on the vein to the extent of 125 feet east and west was accomplished during the year. The property is equipped with a gasoline hoist for prospecting purposes.

Northern Bell Group.

The Northern Bell group, operated by the Northern Bell Mining Co., is situated at Princeton, under the management of J. D. Fields. The work of developing the claims consists in shaft sinking to a depth of 100 feet. The vein has been explored at that point a distance of 150 feet showing sulphides in the vein filling, carrying copper and gold. A raise has been put out to connect with the surface tunnel for ventilation and exit to surface in case of necessity.

The International.

The International property, situated in the Garnet district, has been worked by Albert Leeser and William Liberty under a lease. A shaft has been sunk to a depth of 150 feet on the property which has been equipped with a steam plant of sufficient H. P. to develop a depth of 200 feet, the vein having been developed a distance of 100 feet on the strike at that depth, uncovering some very high grade ore, carrying gold. The property is maintained in a safe condition as far as developed.

Trout Mine.

The Trout property has been operated by a party of leasers during the year. The property has a two compartment shaft which is 350 feet in depth. Operations at present are conducted on the 150 and 200 foot levels. Extraction of ore is the principle mining at present. The property is under the supervision of G. L. Walker.

JEFFERSON COUNTY.

There is much activity in Jefferson county in a mining way. Several old properties have been taken over by companies and put in operation. In the Wickes, Corbin and Warm Spring districts the actual development done in the various camps, shows a stimulation in the several districts. The exploring which has been carried on has proven the permanency of the ore bodies in several of the camps through the entire county. The Montana State Mining Co. is developing a very promising group in the Warm Springs district.

The King Solomon Mine.

The King Solomon is located three miles west of Clancy and is operated by the King Solomon Mining Co., of which I. S. Moreland is General Manager and Superintendent. The prop-

erty is developed by a 300 foot incline shaft. The vein has been extensively developed from each of the shaft levels on the vein west to the extent of 300 feet, cutting several ore deposits in the vein, carrying high values in silver, lead and copper. The shaft has been repaired and equipped with a skip for hoisting purposes. An Ingersoll compressor has been installed for the operation of the drills in the mine. A raise is to be constructed to surface for ventilation and escape to be used in case of necessity. The property has all the indications of a producer with depth.

The Corbin Copper Company.

This company's holdings consist of a group of 23 claims, situated in the Corbin Mining district and have been developed extensively for several years. The development work has been carried on through tunnels, several of the ranging from 300 to 1,400 feet in length. The principle portion of the work has been confined to the Dewey and Bonanza claims. In both of those claims winzes have been sunk below the tunnel level to ascertain the continuity of the ore bodies to a depth of 100 feet in both properties. The values contained are copper, silver and gold. A concentrator of 100 tons capacity has been constructed on the property for the reduction of the mines output. Operations have practically ceased during the last few months. The openings have been properly secured as far as developed. The property is under the charge of Thomas Verden and employs twenty men when in operation.

The Crystal Mine.

The Crystal property, situated in the Basin district, is operated by A. C. Ray. Operations are conducted through a tunnel that has been driven on the strike to a length of 900 feet, showing a well defined ore body carrying copper, silver and lead. The property has been repaired and put in shape for future operations. Escapes to the surface have been put through for ventilation and escape in case of necessity. Ten men are employed in the operations.

Mount Washington Mine.

This property is situated in the Bluebird district, four miles west of Wickes. The development has been through a shaft which has reached a depth of 200 feet, intersecting the vein at that depth. The vein has been explored 500 feet east and west of the shaft, showing it to be a true fissure carrying gold, lead

and silver as the chief values. The property is to be equipped with electric power in the near future. A second opening to the surface is in course of construction for ventilation and escape. The property is under the management of E. W. Wilson, employing eight men.

Ruby Mine.

The Ruby is owned and operated by Patrick Dowling and is situated in the Lowland Mining district. It has been extensively developed during the year uncovering several large ore bodies. It is operated through a tunnel that has reached a length of 2,700 feet. A shaft has been equipped on surface to hoist the product from the lower portion of the mine. Its present depth is 400 feet, 200 feet below the tunnel level. The system is safe. The high grade ores are shipped directly to the smelter. The lower grades are treated in the mill owned by the company, the values contained being gold.

The Mayflower Mine.

Is situated in the Whitehall district and has been leased to Albert Johnston during the year. A tunnel 600 feet has been driven on the property. The extraction of ore is the principal work, several hundred tons having been shipped. Seven men are employed.

The B. and G. Mine.

The B. & G. mine is locally known as the Feming property and is located in Warm Spring Gulch six miles south of Alhambra. It has been constantly under operation during the year under a lease to John Laytch. Regular shipments of ore are made to East Helena. The property is operated through a series of tunnels reaching in length 1,200 and 400 feet on the vein. Little additional work is necessary to place a large amount of ore in sight, which will put the mine on a producing basis for sometime. The property is well ventilated.

The War Eagle.

The War Eagle mine, located seven miles south of Alhambra on Warm Springs Gulch, consists of three claims operated by the War Eagle Gold and Copper Mining Company. A tunnel is being driven to crosscut the country which will intersect the veins at a depth of 500 feet below the apex of the veins. It has reached a length of 300 feet, which will be continued until the 1,500 foot mark has been reached. The formation of the

country is granite. The strike of the vein, east and west. The values contained are principally gold.

The Bullion Mine.

The Bullion group of claims is situated at the head of Basin Creek, 12 miles north of Basin. The property has been extensively developed by a series of tunnels driven on the vein to a length of 800 feet, 3,600 feet on the strike of the vein. The property has been operated under the leasing system by James Madden, ore extraction being the principal work at the present time. Several carloads are shipped monthly to custom smelters, the values being copper, silver and lead. There are 18 men employed on the property.

Fairview Group.

The Fairview group consisting of thirty claims is owned by the Montana State Mining Co., and is situated in the Warm Springs district, and operated under the management of R. A. Bell. A tunnel is in contemplation to be driven to a length of 3,000 feet which will intereseect the majority of the claims at a depth of 800 feet, which will prove the extent and values contained in the several veins in the property. The values are silver, lead and gold, in true fissures in granite.

The Baltimore.

This property has been operated by Charles Whitcomb and J. H. Mulligan under lease during the year, employing 60 men in developing the property and extracting ore, several thousand tons having been shipped. Operations are conducted through a series of tunnels which have reached a length of 500 and 600 feet respectively on the strike. Six hundred feet were accomplished during the year.

The Blue Bird Mines.

This group of mines is situated five miles north of Wickes and is operated by the Blue Bird-Corbin Gold, Silver & Copper Mining Co. Operations are conducted through a series of tunnels which have reached a length of 2,000 feet respectively on the strike of the vein. A winze has been sunk to a depth of 200 feet below the tunnel level developing the vein and the extraction of ore has been carried on at that point during the year. The ore is a sulphide carrying gold, silver and copper. Connections have been made with the upper portion, thus making the tunnel the main artery to the mine. The proper-

ties were extensively developed during the year, 1,200 feet having been accomplished. The plant has been electrically equipped furnishing power for all operations. The mine is fairly well ventilated in most parts, is under the management of John W. Johns, with Thomas Noall foreman, and employs 30 men.

The White Pine.

The White Pine group lays west of the Fleming property in the Warm Springs district. Operations have been conducted through a series of tunnels which have reached a length of 1,200 feet. Operations ceased during 1911 with the exception of repairing the property and keeping it in shape for future operations. It is under the management of J. P. Smith.

The Atlas.

The Atlas group of claims, situated at Wickes, are operated by the Dailey Copper Mining Co., of which W. W. Dailey is manager. A two compartment shaft has been put down to a depth of 300 feet and the vein has been explored on the several levels to the extent of 1,000 feet on the strike, showing a well defined fissure vein carrying copper, gold and silver values. The mine is equipped with a steam plant and cage.

The Alice Group.

The Alice group is operated by John Steinbrenner & Co., and is situated at the head of Warm Springs Gulch. A tunnel has been driven to intersect the vein at a length of 400 feet, 100 feet having been driven during the year. A vein has been cut carrying lead-silver of a very high grade. The tunnel will be extended until the 1,000 foot mark has been reached on the vein. All necessary work for safety has been done.

The Hattie Ferguson.

The Hattie Ferguson mine, situated five miles north of Basin, has been operated by the Pennsylvania-Montana Mining Co., of which J. H. Hildebrand is superintendent. Operations are carried on through a tunnel 500 feet in length, the greater portion having been driven during the year. The character of the ore is silver-lead.

The Elkhorn Mine.

Operated by the Elkhorn Silver Mining Co., J. H. Longmaid general manager, I. Bowden Jr. superintendent and Westley Williams foreman, is being developed to a depth of 2,500 feet

on an incline of 65 degrees. The lower workings of the property have been abandoned and the water allowed to raise to the 1,100 foot station. The matter of cleaning and finishing the extraction of ore has been the principal work during the year with the expectation of abandoning the property, the ore bodies having been exhausted at the present developed stage. The mill is equipped with the latest improved machinery for the reduction of the ores. The principal values contained in the ore are silver and lead. Formerly 200 men were employed but at present there are only 85 men at work.

The Dalport Mine.

The Dalport group, located in the Elkhorn district, is operated through a series of tunnels driven to a length of 350 and 400 feet on the veins, which show a well defined fissure carrying gold as the greatest value. The property has been operated under lease by G. B. Hanes & Co., George Leslie, acting foreman. Regular monthly shipments of ore are made to East Helena.

The Center Reef.

This property, situated nine miles east of Jefferson City, is operated by the Ballard Mining Co., E. G. Ballard superintendent. Several tunnels have been driven to a length of 250 and 400 feet, cutting the formation. An exit of 150 feet has been put out to the surface for ventilation and escape. The most work accomplished was the extraction of ore, which is of a free milling character, principally gold. Nine men are employed.

The Bertha Mines.

The Boston and Corbin Mining Co. is developing the Bertha group, under management of Homer Emerson, Jack Emerson being acting foreman. Forty-five men are employed in developing the property. A tunnel, 1,400 feet long, comprising the upper workings and additional openings. The property has been developed very extensively during the year, 2,000 feet having been accomplished. The shaft has been sunk to 1,000 feet below the tunnel level and the vein has been extensively developed at that depth. Several openings have been made through the vein material to connect with the upper workings to ascertain the continuity of the ore bodies. The plant has been equipped with electric power furnished by the Madison River Power Co. The erection of a concentrator is in

progress with a capacity of 300 tons per day for the reduction of the mine output, which will be completed during the winter.

The Carbonate Chief Mine.

This group, owned by John Steinbrenner, has been under lease during the year to J. C. Adams and G. Stivers, Nelis W. Pearson being superintendent, and employs 32 men. The property is worked through a tunnel 1,600 feet long. The air shaft has been equipped with a steam hoist, operations conducted through it having been sunk to the 300 foot level. Ore extraction has been continuous, the stopes being well filled. The ventilation is excellent throughout the mine.

The Prickly Pear Mining Co.

The company is opening a very promising group of lead-silver properties situated four miles southeast of Jefferson City. A tunnel has been driven in the property which has reached a length of 500 feet, cutting the country and showing some well defined veins carrying high values in lead and silver. The tunnel will be extended until the 1,000 foot mark has been reached to ascertain the values contained in the entire group.

The Golden Curry Mine.

This group of claims is situated on the right fork of Elkhorn Creek and is operated by the Canada Mines Co., Ltd., of which E. L. Gluyas is superintendent and manager. The property was taken over by the company in 1911 and has been extensively developed and repaired for the extraction of ore. The mine is developed through a series of tunnels ranging in length from 200 to 700 feet, to open cuts on the surface. The ore is an iron sulphide carrying gold as its chief value. Regular shipments are made to East Helena. The workings are secured by timbering and filling. Seventy men are employed.

The Assets Gold Mining Company.

The company is developing a very promising group of claims in the Golconda district under the management of Colin McIntosh. A lower tunnel is to be driven to a length of 1,200 feet which will cut the ore body at a depth of 400 feet, the tunnel now being 800 feet long. The mine produces high grade ores of a free milling character, carrying gold. The upper portion is operated through a series of tunnels. The plant employs 20 men and is electrically equipped from the Missouri River Power Co.

Knob Hill.

This property is operated by the Knob Hill Mining Co., and is situated in the Clancy Mining District. Operations are by an incline shaft which has reached a depth of 200 feet. Drifting east and west on the vein a length of 300 feet has been done to determine the extent of the values contained, which are silver and lead. The property has been equipped with a steam plant. Wm. Steuwe is superintendent.

The Drake.

This group of claims, operated by Col. Lloyd, is situated in the Corbin district southeast of the old Alta mine. A tunnel has been driven a length of 300 feet on the strike opening several well defined ore chutes carrying silver and lead showing commercial values, several small shipments having been made.

Colorado Mine.

The Colorado mine, situated four miles south of Whitehall, conducts operations through a shaft 200 feet in depth. It is equipped with steam hoist and cage with all safety appliances. The vein has been developed to a length of 400 feet. Several bodies of high grade ore have been developed of a free milling character. The mine is maintained in a safe condition.

Alta Extension.

The group of claims comprising the Alta Extension is operated by the Chicago & Alta Mining Co., and is situated in the Corbin mining district, under the management of J. K. Harris. A tunnel has been driven in the property to a length of 1,000 feet which will be connected by a shaft which is being sunk to a depth of 350 feet, providing a connection to surface and for ventilation as well. The ore is characteristic of the camp, gold, silver and copper.

The Abe Mine.

This claim is situated in the Bluebird district and has been opened by a tunnel 450 feet in length on the strike of the vein which will be extended until the 1,000 foot mark has been reached. The work is in the nature of developing the country to ascertain the continuity of the ore bodies. The work has been under the management of R. A. Graham.

The Good Cheer Mine.

The Good Cheer Mining Co. is operating a group of claims seven miles south of Clancy. They have been closed for a

short period but work has been resumed and the mine unwatered and put in shape for future operations. A two compartment shaft has been sunk to a depth of 200 feet, equipped with a steam boiler and hoist. The workings will be repaired and further development carried on to ascertain the future of the property before the erection of a concentrator. The property is under the management of Joseph Garnier.

The Rose Mine.

This property, operated by the Progress Mining Co., is situated in the Clancy mining district. F. J. McCormack is the superintendent in charge. Operations consist of a shaft 150 feet deep, at which point the vein has been developed to a length of 500 feet showing ore of commercial value, silver and lead. The property is equipped with a gasoline plant for developing purposes.

The Daphne Group.

The Daphne group of claims, situated in the Corbin district, is operated by the South Butte Mining Co. A shaft has been put down to a depth of 165 feet, a tunnel having been driven on the vein a distance of 400 feet and connections are made at that point, which affords ventilation and exit to surface in case of necessity. The formation is a porphyritic granite, carrying silver and lead in the vein filling. R. H. Sheaffer is the manager in charge.

The Robert Emmett.

The Robert Emmett Copper Mining Co. is operating in the Amazon district. A perpendicular shaft has been sunk to a depth of 500 feet, 150 feet of which has been sunk during the past year. A tunnel 600 feet in length has been connected with the shaft at a depth of 170 feet, the same being used for drainage and ventilation. Developing the vein on the 500 foot level east and west has been continuous during the year, some 800 feet having been accomplished since the resumption of operations. The entire plant is electrically driven, additional power having been added during the year. An Ingersoll compressor has been installed furnishing the power for drilling and pumping. The ore is a sulphide carrying copper, silver and lead. The property is under the supervision of J. W. Johns, Daniel Macginness being foreman, and employs 30 men.

LEWIS AND CLARK COUNTY.

Lewis and Clark County has a great area of mineral territory bearing gold, silver, lead and copper, with the former predominating. The territory between Marysville and the Gould district is a network of gold bearing veins which offer attractive opportunities for the successful development of large and profitable producing mines, and which has not been prospected, much less developed. The Rimini district and the districts adjacent to Helena afford great opportunities for investments. These districts merit more attention from the mining public than they have so far been accorded. In the Marysville district many meritorious prospects are lying idle waiting for actual development to bring them into the producing class of mines. The Bald Mountain group of claims operated by the Cruse Mining Co., are producing thousands of dollars monthly. They were considered worthless until a certain amount of development had been done and the vein been exposed which has proven the property to be in the million dollar class of mines. The Drumlummon company is contemplating extensive development which will put the old property in a high state of production. I am strongly of the opinion that were a limited amount of capital judiciously expended in the development of these several districts, as good mines as have been found in the state would be discovered. All that is necessary is for capital to become interested in the proper development of the many hundreds of promising bearing prospects.

Mark Hanna Group.

This group of mines, situated eleven miles west of Helena, is operated by P. L. Reece. The property has been explored by a shaft sunk to a depth of 200 feet, equipped with a steam hoisting plant and compressor for the operation of the drills used in the development. The shaft will be continued until the three hundred foot mark has been reached. The property will be thoroughly explored from that depth. The vein has an easterly and westerly strike, showing it to be a true fissure vein, carrying gold, silver and lead in the vein filling. The property has been repaired and made secure for the nine men employed.

The Annie Dillon.

This property is situated at Marysville in the vicinity of the

Bald Mountain mine. The property has been developed by a series of tunnels being run on the property 200, 700 and 900 feet respectively, cutting several ore chutes which carry some very high values in gold. The company is contemplating the driving of a tunnel much lower on the mountain to prove the extent of the ore bodies. The property is operated by the Marysville Gold Mining Co., R. W. Koontz manager.

Piegan and Gloster Group.

This group of claims has not been operated for several years. It has recently been taken over by the Barnes-King Gold Mining Co., under the management of George T. McGee. The property has been opened by two tunnels on the vein, the lower being 1,200 feet in length. From the lower tunnel, 750 feet from its portal, a winze has been sunk to a depth of 125 feet. The company contemplates driving a lower tunnel which will unwater the entire group to that depth, doing away with the expense of pumping. The vein is from four to fourteen feet in width and carries good values in gold. All arrangements are completed for the erection of a mill in the spring for the reduction of the mine output. When thoroughly opened it is expected to be one of the largest gold properties in the state.

The Caroline.

The Caroline group of seven claims are located four miles west of Helena, and is owned by the Caroline Gold Mining Co. The property has been developed by an incline shaft which has been sunk to a depth of 80 feet on the vein. The vein has been explored to a length of 90 feet, showing several well defined ore bodies which carry high values in gold of a free milling character.

The Tave Mine.

This property, five miles north of Helena, is owned by the Copper-Silver Montana Mining Co., and is under the management of E. R. Purnell. A two compartment shaft has been sunk to a depth of 300 feet for exploring purposes, a true fissure vein having been cut carrying copper, silver and gold. Sulphides appearing in the vein show indications of copper when greater depth is attained. The formation of the country is silicious and dioritic porphyry. The equipment consists of a steam boiler and hoist. A safety crosshead has been installed.

The Jay Gould Mines.

This property is situated in the Gould district and is oper-

ated by the Gould Consolidated Mines Co., the property having been taken over by them, forming the consolidation. The properties are so situated as to be conveniently operated through the same plant. Operations are conducted through the main tunnel that has reached a length of 2,300 feet. Ore extraction is carried on above the tunnel level. The ore, being a free milling product, is treated in the 20 stamp mill in operation at the property. A cyanide plant has been installed, effecting a greater saving of values. The property has been in constant operation during the year under the management of Owen Byrnes, T. J. Cullen being the foreman, and employing 40 men.

Valley Forge Mine.

The Valley Forge group of mines, located at Rimini, were operated by leasers during the year, who having extracted several cars of high grade ore, it is the intention of the company to resume operations in the near future. The lower tunnel will be extended to a length of 1,200 feet, which will intersect the vein at a depth of 700 feet below the lowest workings of the mine. The property is under the supervision of H. S. Brownlow, employing 12 men in the tunnel level.

The Belmont Mine.

This property, formerly owned by the Belmont Mining Co., has recently been taken over by the Cruse Mining Co. and operated in conjunction with the Bald Mountain group. Connections are made for the transportation of ore by train to the mill on the Bald Mountain side. Several thousand feet of development has been done by the company for exploring purposes and to ascertain the continuity of the ore body.

The Emma Group.

The Emma group consists of six claims in the Rimini district and is operated by W. B. Phillips and C. H. Powers of Helena. It is being developed by a tunnel cutting the country, which has reached a length of 600 feet, and surveys indicate that the tunnel will be extended to a length of 1,600 feet to prove the merit of the property. The ore is lead, silver and copper bearing.

Mother Lode Claim.

This claim is situated in the Unionville district south of Helena. The property was operated in 1911 but during this year operations ceased owing to some disagreement in the

company's ranks. A tunnel 900 feet in length has been driven for the purpose of exploring the vein on the strike. The vein is a contact between lime and granite which shows large ore bodies in the development. Operation of the property is looked for at an early day.

Annie Laurie.

This property, owned by Charles Gabisch, is situated in Skelly Gulch, 18 miles west of Helena, and is developed by two tunnels which have reached a length of 300 and 700 feet respectively, showing a well defined body of a free milling gold ore in character. The development work has been very extensive during the year.

The Strawberry Mine.

The Strawberry group of mines is situated in the east part of Skelly Gulch and is operated by the Strawberry Gold Mining Co., R. E. Hendricks being superintendent, and employs 14 men. Development consists of a tunnel 500 feet in length which tapped the lowest workings of the 185 foot shaft in the old workings, the ore being conducted to the mill by tram, doing away with the hoisting and pumping plant. The mill is a ten stamp mill erected for the reduction of the product of the mine. The values are gold of a free milling character.

The Johney Group.

This group has been developed very extensively during the last two years by the Swan Bros., who have the property under bond. An adit tunnel has been driven to cut the vein at a much greater depth and several well defined veins have been cut showing some high grade ore in silver and lead values. The property shows well as far as developed and has been made secure by timbering.

The Gold Leaf Mine.

This property is situated in the Stemple district and is operated by Wm. Burkhead, who is the original owner. A tunnel has been driven to a length of 300 feet, where the ore body has been cut and ore extraction at that point has commenced. The ore being of a free milling character, is treated in a five stamp mill which has been erected on the property. The mine has been kept in a fair condition as far as developed.

Penobscot Group.

The Penobscot group of claims is situated in the Bald Butte

district. The property is developed by a shaft 200 feet in depth and a tunnel 400 feet long on the strike of the vein. The vein is from two to four feet in width and is continuous through the entire claim. The property is operated by Matt W. Alderson. The values contained are principally gold of a free milling character.

Bald Butte Mine.

The mine and mill of the Bald Butte Mining & Milling Co. are situated in the Marysville district. After a long period of idleness operations have been resumed. Extensive development has been carried on in the mine. The new ground that has been explored has proven satisfactory both in tonnage and values. The main vein is developed for a length of 2,700 feet. The ore is mined, transported and milled at a very moderate cost, while the mill is a model of its kind. G. M. Padbury is the manager and Oscar Fred the superintendent of the mine.

The Drumlummon Mine.

After a long period of idleness this property has been put in shape for extensive operation. The sixty stamp mill has been overhauled for the reduction of the mine output. The operations are confined to the extraction of ores in the upper workings, the lower levels of the mine having been permitted to fill with water. The care and precautions exercised for the safety of the employees have not been relaxed during the reopening of the mine, which is under the supervision of James Collins and employs 40 men.

Little Dandy Group.

The French Bar Gold Mining & Milling Co. are operating a group of eight claims situated at York. The properties are operated by a series of tunnels ranging in length from 200 to 800 feet. A shaft has been sunk to a depth of 50 feet below the main tunnel for the purpose of ascertaining the extent of the veins. The values contained are principally gold. The main tunnel will be continued on its course in order to prove the merits of the entire group. The property has been under the supervision of Robert Roskelly.

Gold Queen.

This property has been operated by Steuwe and Leggrand during 1911. The vein has been developed to a length of 300 feet by a series of tunnels which have been connected by a raise which furnishes ample air and the means of escape in

case of accident. The ore has been reduced in a mill which has been erected adjacent to the property. The property is under the management of Wm. Steuwe.

The Buffalo Mine.

The group owned by the Buffalo Mining Co. has been leased to Swanson Bros. during the year. It has been repaired and put in shape for future mining. The tunnel has been extended to a length of 300 feet, opening some very extensive ore bodies showing high values in silver and lead and of which regular shipments are made to the smelter at East Helena.

The Golconda Mine.

The property of the Golconda Gold Mining Co. is situated in the Gould mining district one-half mile west of Jay Gould. A crosscut tunnel has been driven to a length of 2,700 feet which has cut several veins of gold bearing ore which is of a free milling character. The property has been developed extensively during the year under the supervision of G. O. Teggell.

The Standard Mine.

This property is situated in the Marysville district and is operated by the Standard Mining Co. Several tunnels are in operation, having been driven to a length of 700 and 800 feet where the vein has been encountered showing several ore bodies carrying commercial values in gold. In the exploring work six men are employed.

The Honeycomb Mine.

This group, situated in the Marysville district, is owned and operated by Frank Locker & Co. A shaft has been sunk to a depth of 200 feet for prospecting purposes which is equipped with a 7x12 Frazer & Chalmers steam hoist and $\frac{5}{8}$ inch steel cable. Considerable exploring has been accomplished east and west from the shaft, the work being confined to prospecting the country, which has developed ore bodies very extensively of a free milling gold.

The Bald Mountain Mine.

The Bald Mountain group, situated in the Marysville district, is owned and operated by Thomas Cruse under the supervision of J. A. McKilligan and employs 85 men. Operations are conducted through a series of tunnels which have reached a length of 1,000 and 2,000 feet respectively on the veins. A

shaft 200 feet in depth was sunk on the ore body below the tunnel level, which has proven the permanency of the ore. Connections have been made from the lowest point to surface. The ventilation is excellent. The property has been extensively developed during the year. The 20 stamp mill in connection has been in constant operation treating the output of the mine at a very moderate cost. Everything necessary in the mine is provided.

The Evening Star Group.

The Evening Star group has been developed very extensively by the Victor Gold Mining Co. under the management of J. A. Rowand. The discovery having been made on the mountain top necessitates a very heavy expense to convey the ore to the mill. A tunnel has been driven from the base of the mountain where all ore mined is gravitated to the mill by tram, effecting a great saving. The tunnel has reached a length of 700 feet. An upraise which connects all upper workings with the tunnel has been constructed which will furnish ventilation and escape in case of necessity. The ore is an iron oxide in character which will be treated by the cyaniding process for the recovery of the values, which are principally gold.

LINCOLN COUNTY.

Lincoln County has not attracted the attention which this mineral bearing section merits. The entire Cabinet range south of Libby has some of the most meritorious mineralized zones in the state. Where the proper development has been done commercial ore has been discovered in all parts of the district. Considerable capital has been invested in the Snowshoe district and plans are under way for installing the necessary plants for the reduction of ores which are of a concentrating character. Promising copper lodes have been found on the North Fork of the Flat River. The Libby and West Fisher districts show a steady improvement.

The Carbonate Queen.

This property is situated on Grouse Mountain, eleven miles south of Troy. Its operations are conducted by the Carbonate Queen Mining Co., of which Charles G. Reeder is the superintendent. In developing the property several tunnels were driven for exploring purposes, the longest having reached a

length of 700 feet. Several shipments of ore have been made, the ore being of a silver-lead character. The development has been made secure by timbering.

Victor Empire.

This property is operated by the New Victor Mining Co. and is located 14 miles up Granite Creek, south of Libby. It is under the supervision of P. S. Rose. It has been opened by a crosscut tunnel 1,350 feet long which cuts several well defined veins carrying commercial values in silver and lead. Development has been done by a power drill, a turbine water wheel furnishing the power for the compressor plant.

The Victoria Mine.

This group of claims is located in the Sylvanite district, 24 miles north of Troy, on the Yahk River, and is operated by Frederick Lang, who is developing the property by a tunnel that has reached a length of 800 feet. The ore is a sulphide in character carrying copper, gold and silver. Several small shipments have been made to ascertain the best method of concentration.

The Silver Tip.

The Silver Tip group of claims, situated on Grouse Mountain some eight miles south of Troy, has been developed by a tunnel which has reached a length of 600 feet on the vein. A shaft has been put down 150 feet below the tunnel level to ascertain the continuity of the ore body. The property has been extensively developed during the year.

Montana Morning.

This property is situated seven miles south of Troy and is operated by the Montana Morning Mining Co. Operations are conducted through a series of tunnels which have been driven 700 and 350 feet on the vein, uncovering several deposits of shipping ore of a lead-silver character. A shaft has been put down from surface which will be tapped by the tunnel for ventilation and exit. The property is under the management of W. R. Biggs, and employs 25 men when in operation.

The Shaughnessy.

The Shaughnessy Hill group of mines is situated on Granite Creek eight miles south of Libby and is operated by A. J. McCormick and John Town, the former being the superintendent. Operations are conducted through a series of tunnels 700 and

500 feet long respectively on the vein. The ore is a silver-lead in character, several cars having been shipped. The property is in fairly safe condition as far as developed.

The Keystone Group.

The Keystone group is operated by the Lincoln Gold Mining Co., and is situated twenty-four miles north of Troy in the Sylvanite district. H. I. Reynolds is superintendent and employs 35 men when in operation. The mill was destroyed by fire, but is in course of reconstruction and will be completed during the year, when operations will be resumed. Operations are conducted by tunnels which have reached lengths of 700 and 900 feet on the vein. A tram has been constructed which conveys the ore a distance of 2,400 feet to the mill, which will have a capacity of 200 tons. The ore is an iron oxide in character carrying gold values.

The Silver Crown.

This property of the Silver Crown Mining Co. is situated ten miles south of Libby. J. K. Oaks is general manager. In the development of the property a tunnel has been driven on the vein 500 feet. Several shipments of ore have been made. The values contained are lead and silver. The reduction plant at the property has not been in operation during the year as only the high grade ores have been extracted. The property has several openings to surface for escape and ventilation.

The American Kootenai Company.

This company is operating two claims on the West Fisher Creek, thirty-five miles south of Libby. Developments are through tunnels 250 and 400 feet long which are connected by a raise. Operations ceased in the early part of the year owing to a snow slide destroying the greater part of the mill. Work has been resumed on the mill, which has been repaired, and work at the mine will resume at an early day. An aerial tram is to be constructed which will be 2,240 feet in length, and will transport ore to the mill. John A. Town is manager.

The Snowshoe Mine.

The Pacific Coast Co.'s mining property consists of a group of claims known as the Snowshoe group and situated at the head of Snowshoe Gulch, 23 miles south of Libby. The property was in constant operation during the year, employing from 50 to 75 men under the management of R. C. Davis. A

550 foot shaft has been sunk from the level of the lowest tunnel, securing a total depth of 1,800 feet below the apex of the lead. The vein shows up well on the lower levels showing increased values in gold. The property shows permanency as depth is attained. There are numerous connections throughout the workings affording ample means of escape and ventilation. The concentrator plant on the property has been in constant operation for the reduction of the mine output, which is about 100 tons per day.

The B.-B. Group.

The B.-B. is located on the west side of Grouse Mountain and has been recently taken over by the Greenough Investment Co. The property has been extensively developed during the year. The lower tunnel has been extended on the vein to a length of 900 feet. The upper workings will be connected for ventilation and exit. The vein is a well defined, persistent fissure carrying high values in zinc and lead, the formation being a slate and schist. A reduction plant is in contemplation. The property is under the supervision of G. R. Brownlow and employs ten men.

The Big Eight Mine.

The Big Eight group, owned by the Silver Torrent Mining Co., which has been operated under a lease by R. C. McCaffey, is operated through tunnels, the lower being driven from the creek bed and which cuts the vein at a depth of 600 feet. An intersecting tunnel has been driven through the ridge, which affords an exit and ventilation. The principal work is the extraction of ore which is a heavy sulphide of zinc carrying high silver values. The property is in fair condition as regards safety.

The Great Northwest.

This property consists of four claims situated eleven miles south of Troy and is owned by Robert Gregg. Operations are conducted by a series of tunnels ranging in length from 200 to 400 feet on the vein, carrying values in silver and lead. The principal work has been developing the vein to ascertain the continuity of the ore bodies. The development consists of the continuation of the operating tunnel.

MEAGHER COUNTY.

Much more activity prevailed in most parts of the county in a mining way than in recent years. The old Copperopolis has been active in developing work. The Home Copper Mining Co. is operating a group of claims at Mindin. The Copper State Mining Co., thirty miles north of Martinsdale, has shown some very promising copper discoveries as far as developed.

The North Pacific.

This mine is located at Copperopolis and has been operated under lease during the year. A large amount of development work has been done above the water level and some very high grade copper ore has been extracted. Development will be extended further in order to test the merits of the vein in the property. The principal values are copper and silver.

The Copper State Mine.

The property owned by the Copper State Mining Co. is situated thirty miles north of Martinsdale on the north side of Smith River. It has been developed by a two compartment shaft that has reached a depth of 200 feet. Development has been going on steadily to ascertain the extent and value of the ore bodies. In the near future the shaft will be sunk to the 500 foot level, in which extensive mining will be carried on. The values contained are copper and silver, which show to be of a shipping character. S. W. Wells is superintendent in charge.

Home Copper Mining Company.

This company, operated under a working bond, owns a group of copper bearing claims at Mindin, and did a large amount of developing work, sinking a shaft 330 feet and drifting several hundred feet on the vein. Recently a very heavy flow of water was encountered which, I am advised, necessitated a temporary shut down.

The Claraton Group.

The Claraton group of claims operated by Sam Southworth & Son is situated twelve miles north of Martinsdale. A two compartment shaft has been sunk on the property to a depth of 300 feet, one hundred feet having been accomplished during the year. A large vein containing copper values of a concentrating character has been uncovered. In developing the vein on the various levels the work has been done in a safe manner. Sam Southworth is general manager.

The Moonlight Mine.

The Moonlight property is located at the head of White-stone Creek in the vicinity of Copperopolis. A tunnel 700 feet long has been driven to develop the vein at a depth of 400 feet, several hundred feet having been accomplished during the year. The values contained in the vein are copper and silver. The work has been made secure as far as developed. John Weston is in charge of the property.

The Durant Group.

This property is operated by the Durant Mining & Smelting Co., C. M. Durant superintendent. The property is situated on Spring Gulch, fourteen miles from Martinsdale. Development is progressing at the present time. A two compartment shaft has been put down to a depth of 200 feet, which was accomplished during the year, and all necessary machinery for safety has been installed. Escapes to the surface have been made in case of accident. The ore in the vein is a sulphide carrying copper and gold values.

The Blue Eyed Nell Mine.

This group of claims is situated on the divide between Fergus and Meagher counties. Operations are conducted through a tunnel which has reached a length of 400 feet, cutting the vein 300 feet in depth. Considering the amount of development accomplished the mine shows exceedingly well. It is made secure by timbers throughout. Sinking below the tunnel level is in progress to attain a much greater depth. It is owned by Hughes & Slater, the former being the foreman of the property.

MISSOULA COUNTY.

Owing to a bill passed by the last legislative assembly, a large mineralized zone was taken from Sanders County and given to Missoula County, giving the latter a scope of mineralized country not excelled in the state. No region in this or any other of the mining states affords to the prospector, miner and capitalist a field where the prospects for success are any better than those to be found in the region taken over by this county. The present development has proven the district to be of some merit and that it will, in the near future, have several producing mines.

Gold Crown Mine.

The property operated by the Gold Crown Mining Co. is situated three and one-half miles south of Deborgia. It has been put in shape for extensive development by tunnels that have reached a length of 300 and 500 feet. Connections are made furnishing ventilation and exit in case of necessity. The old mill has been repaired and increased to a capacity of 200 tons. The ore is an oxide of iron and its values are principally gold. The property has been under the management of H. L. Berkley and employs 30 men.

The True Fissure.

The property of the True Fissure Mining Co., situated five miles north of Deborgia, has been developed through a tunnel which has reached a length of 2,200 feet for exploration purposes, cutting the formation and opening several veins showing very extensive ore bodies of a shipping character. William Trentesaky is superintendent and 8 men are employed.

The Ben Hur Group.

The property operated by the Ben Hur Mining Co. is situated five miles north of Saltese. Operations are by a tunnel that has been driven which taps the vein 500 feet in depth, the length being 1,400 feet. Development has uncovered some very extensive ore bodies of a shipping character, carrying lead and silver, showing a true fissure vein cutting slate and quartzite formation. Development has been continuous during the year, giving employment to 14 men under the supervision of Joseph Laundry.

Hugo Mine.

The property owned by the Hugo Gold & Copper Mining Co., located at Saltese, is operated through a series of tunnels which have been driven to a length of 200 and 700 feet respectively on the strike of the vein, which is a sulphide in character carrying copper values. The property is in charge of R. W. Stitesman and employs 7 men.

The Shaughnessy Mine.

The Reily Bros. are developing a very promising group of claims seven miles north of Clinton. The work of driving a tunnel on the vein for a length of 700 feet, in order to prove the merit of the lode, was accomplished early in the year and the vein showed to be permanent and of a fair size, carrying

copper, gold and silver which netted a good margin of profit when shipped.

Hamilton-Montana Mine.

The property of the Hamilton-Montana Gold Mining Co. consists of a group of claims operated through a 400 foot tunnel which has been driven, crosscutting the formation. The ore body will be cut 700 feet in depth. The principal values contained in the vein are copper with a small percentage of lead. The property is under the supervision of Richard Daxon. Extensive explorations have been contemplated during the year.

Jack Pot.

This promising group of mines is situated three miles north of Clinton. The operations consist of series of tunnels driven on the strike of the vein, 100, 300 and 500 feet respectively, uncovering several well defined ore bodies showing copper, gold and silver values, the ore being of a concentrating character throughout the entire vein as far as developed, the ore being continuous in the face of the tunnel.

The Triangle Mine.

The property of the Triangle Mining & Developing Co. is developed through a tunnel which has been extended on the strike of the vein a length of 500 feet, which has an easterly and westerly strike. A two compartment shaft has been sunk to a depth of 100 feet below the lowest workings to determine the continuity of the vein at that depth. The principal values contained are copper, gold and silver. An air compressor has been installed which furnishes power to operate the drills used in the developing. The formation is granite, showing a true fissure vein. The property is under the management of R. B. Hughes and employs 12 men.

The B., A. & P. Group.

The B., A. & P. group of fourteen claims is situated west of Saltese. Operations are conducted by Hall, Lusk & Co. The properties are developed through a tunnel which has reached a length of 500 feet. The work will be continued until the 800 foot mark has been reached. The present development shows sulphides carrying silver, lead and copper in the vein filling.

The Gold Property.

This property, operated by the Carter Mining & Smelting Co., is situated four miles west of Carter and has been de-

veloped by tunnels which have been driven to a length of 400 and 1,100 feet respectively on the strike of the vein, developing some very extensive ore bodies carrying high values in gold, which is free milling in character. The property is under the supervision of L. C. McHafferty, was extensively developed during the present year, and all precautions taken to prevent accidents.

The Iron Mountain.

The property of the Iron Mountain Tunnel Co. is located northwest of Superior. The operations are conducted through a tunnel, 5,600 long, which cuts the old work shaft 1,600 feet in depth. The shaft has been extended below the tunnel 400 feet, giving a total depth of 2,000 feet. The vein has been explored, showing very extensive ore bodies on the strike. The overhauling of the present concentrator is being done with a view to electrify the entire plant, the power to be furnished from Thompsons Falls, a distance of twelve miles. The ore will be gravitated to the mill by the electric tram. The product of the mine is a sulphide carrying high lead and zinc values. The property has been extensively developed during 1911 under the supervision of J. C. Daily, employing, when in operation, 50 men.

The O. R. N. Group.

The Couer d'Alene Investment Co. is operating the O. R. N. group of mines situated in the Carter district, under the management of E. Lewis, employing 8 men. Operations are conducted through a tunnel 2,800 feet long. The property has been systematically developed. Four hundred feet has been opened on the vein, which shows a strong fissure carrying high values in silver and lead.

The Golden Eagle.

The Eagle Mining Co. is developing a group of claims situated in the Carter district by a series of tunnels which are driven to a length of 300 and 1,000 feet on the vein, showing a very extensive ore body carrying silver and lead as the principal values. The property was developed extensively during the year under the management of William Hutchan.

The King and Queen Mine.

The King & Queen Mining Co. is doing extensive developing on its group of claims situated in the Carter district. The upper portion of the mine has been abandoned for a time. A lower

tunnel has been in course of construction which will be driven to a length of 1,600 feet when completed and will intersect several known veins on its course and which will intersect the main vein at a depth of 400 feet below the present workings. A winze 200 feet in depth will be cut for ventilation and exit to surface. The values contained are gold and copper. Ore extraction is in progress on the lower workings. C. B. McKennan is the acting superintendent in charge.

Last Chance.

The Last Chance property, situated in the Saltese district, has been developed to the extent of 600 feet through a tunnel, uncovering valuable ore bodies of a shipping character. Development shows a well defined vein carrying silver and lead as the principle values. George Champlain is the manager and employs six men.

The Buffalo Mine.

The Buffalo property has been operated through a series of tunnels, of 700 and 800 feet in length. The property has been extensively developed during the year, the vein having been opened to a length of 300 feet. The character of the ore is a sulphide, carrying high gold values with a small percentage of copper. The property was in fair condition, under the management of Patrick Conroy and employs 12 men.

The Iron Mask.

The property of the Iron Mask Mining Co. has been explored very extensively during the year. A lower tunnel has been extended to a length of 1,700 feet of which 1,200 feet was accomplished during the present year. Developing the vein at that point has been vigorously prosecuted on the strike, cutting several veins of a concentrating character, carrying lead and silver and a small percentage of copper. The vein has been extensively developed, 2,400 feet having been accomplished on the strike, which shows permanency of character. The property has been under the supervision of J. B. Hunter.

The Glen Metal Mines.

The property of the Glen Metal Mining Co., consisting of a group of five claims, has been developed through a tunnel that has reached a length of 2,200 feet, cutting the formation which is principally slate. It is the intention of the company to drive until the 3,000 foot mark has been reached, in order to prove

the value of the ore contained in the entire group. The property is under the management of W. M. Bryan when in operation.

The Silver Cable Mine.

The property of the Silver Cable Mining Co., which is situated twelve miles west of Saltese, was developed very extensively during the year. A tunnel has been driven on the property to a length of 1,900 feet, 400 feet of which was accomplished during the year. Some very extensive ore bodies were cut in the operation showing high values in silver and lead. The property is under the supervision of William Roach, and employs ten men.

MADISON COUNTY.

In its mineral possibilities Madison County ranks with the most favored of the mineral bearing sections of the state. The workable lodes are not limited to any particular district, as at least two-thirds of its area is of a mineral character and producing mines have been developed in nearly every part that has been exploited. The future growth is assured by undeveloped and meritorious prospects that are found in all points of the county. The Virginia City and Twin Bridges districts are coming to the front and are showing permanency as far as developed.

The Hihup Mine.

The Hihup group of claims, located seven miles south of Virginia City, has been developed very extensively during the year by the owner, E. W. Merritt, acting superintendent, in charge of the property. It has been opened by a tunnel 1,100 feet in length, giving a depth of 500 feet at the face of the lower works. Several large ore bodies carrying high values in gold, have been explored in the workings. The property has been closed temporarily pending the erection of a mill for the reduction of the mine product.

Empire Exploration Company.

The Empire Exploration Co. is developing a very promising group of claims ten miles east of Twin Bridges. The property has been developed by several tunnels which have been driven to a length of 100 and 150 feet respectively, on the vein, which carries substantial values in gold, silver and lead. The property is under the supervision of H. Strasberger.

The Nelly Bly.

The Nelly Bly group of claims has been developed by the Butte & Virginia Mining Co. A series of tunnels has been driven on the claims to a length of 300 and 500 feet respectively on the strike of the vein. Several commercial ore chutes have been opened in the development showing high values in gold. Seven men are employed in the operations.

The Revenue Mine.

The Revenue group of claims, located six miles south of Norris on, what is locally known as Richmond Flats, is owned by the Montana Revenue Gold Mining Co., and has been operated under the leasing system for the past two years. The work has been confined to the extraction of ore from the upper portion of the property, the ore being a cyaniding gold, which is treated in the plant situated on the property.

The McKee Mine.

This group of claims is located at the head of Meadow Creek, and has been operated by Asker Lennon, who is acting superintendent. The property has been developed through tunnels varying in length from 500 to 300 and 250 feet on the veins. Connections have been made which connect all workings to the surface, furnishing the mine with ample ventilation. The values contained are principally gold.

The Germania Group.

The Germania group of claims are developed by the Gold Crown Mining Co. A shaft has been sunk to a depth of 100 feet to determine the values contained at that point. The vein has been explored to a length of 200 feet showing gold values in the vein filling. The property has a good showing and is properly opened and made secure as far as developed.

The Clipper Group.

The Clipper group of claims, situated three miles west of Pony, near the summit of the Tobacco Root Range, is operated at present by Smith, Powling & Co., E. J. Smith, General Superintendent. The property is worked through an adit tunnel, which has reached a length of 2,600 feet. The ore bodies are very extensive, being a sulphide in character, the principle values contained, being gold. The product is treated in a mill constructed by the company at the mine with a capacity of 50 tons. The mill is equipped with Overstrom tables

and vanners, effecting a great saving on the plates. The mine and mill are equipped with electric power throughout and employ forty men.

The Bismarck Mine.

The Bismarck Mining Co. is developing a group of four claims in the Mammoth district, south of Jefferson Island. Operations are by a tunnel that has reached a length of 900 feet. Several large bodies of ore, of a concentrating character, have been developed, containing copper and silver values. A new concentrator is in course of construction for the reduction of the mine output. The property is under the management of B. W. Wilson, and employs twelve men.

The Lehigh Mine.

The Lehigh is a very promising group of claims situated in Meadow Gulch and is owned and developed by Hugh Elliott. A tunnel has been driven on the strike to a length of 700 feet, several high grade ore bodies having been explored in the development, with depth of 400 feet. The ore is a free milling gold.

The Whippoorwill.

The Whippoorwill property, owned and operated by David Phillips, is situated in the Pony district. A crosscut tunnel has been driven which has cut the vein at a length of 400 feet. The vein has been explored on the strike a length of 300 feet, developing several commercial ore bodies of free milling gold, from which several carloads were shipped. The property is ventilated by tunnel connections.

Winnetaka Mine.

The property has been developed through a series of tunnels ranging in length from 200 to 400 feet on the vein, showing a well defined ore body, carrying high values in free gold, the mineralization of the vein becoming greater as the lower tunnel is extended into the mountain. A ten stamp mill is to be erected for the reduction of the mine output. Under the supervision of F. C. Ball.

The Little Kersage.

This group of six claims owned by W. B. Millard and C. L. Cadell is situated six miles south of Virginia City, adjoining the old Kersage Mine. In order to prove the continuity of the ore bodies a crosscut tunnel has been in course of con-

struction to intersect the veins at a depth of 500 feet, which has been driven to a length of 600 feet during the year. The character of the ore is a free milling gold.

The Old Colony Group.

The Calamont Mining Co. is developing a group of fourteen claims in the Cottonwood district, five miles south of Norris, the early development being by shaft. To eliminate the handling of water a tunnel is in course of construction which will be driven to a length of 1,500 feet, which will intersect several known veins in the property which carry commercial values in silver and lead. The properties were extensively developed during the year under the supervision of J. J. Comeford.

The Blowout Mine.

Blowout group, situated in the Rochester district, has been taken over by the Corbin Copper Co. The property has been developed to a depth of 300 feet by a perpendicular shaft which has been equipped by the company with machinery of sufficient horse power to attain the additional depth of 500 feet. The property has a well defined vein of a sulphide character carrying copper and gold values and is under the supervision of Thomas Verden.

Lake Shore Mining Company.

The properties of this company were in constant operation during 1911 and part of the present year. They consist of seven claims situated at the head of Wisconsin Creek near the summit of the Tobacco Root range, at an elevation of 9,000 feet. The property has been opened by two parallel tunnels which are driven to a length of 500 and 200 feet respectively. These cut two gold bearing veins which are drifted on, in the aggregate, 500 feet, the product being reduced in a mill constructed on the property.

The Roach Group.

The Roach group of claims is being developed by the Cornelia Mining Co., under the management of Daniel Argo, and employs 10 men in the development. Several tunnels have been driven on the various claims which show ore of a commercial value carrying gold, copper and silver. A mill has been erected on the creek some two miles from the mine for the reduction of the mine output. The property is located on Wisconsin Creek, twelve miles from Sheridan.

The Bedford Mine.

The Bedford group, situated thirteen miles from Sheridan on Ramshorn creek, is operated by the Waters Tunnel and Mining Co., under the management of E. J. Waters. The property has been developed by a crosscut tunnel, driven to a length of 500 feet, which intersects the vein at that point. The ore body has been explored for a length of 600 feet, showing a well defined vein of a concentrating character carrying silver and lead as the principal values. The erection of a 150 ton concentrator has been under advisement by the company and the last report from the district shows the construction work under way. The company is employing 20 men.

The Strawberry Mine.

This property has been operated intermittently for many years and a large tonnage of ore in the aggregate has been shipped from the immediate vicinity. It is developed by cross-cut tunnels, the lower, or main tunnel, being 1,300 feet long. An upraise has connected the workings, which starts at a point in the main tunnel. The ore mined in the upper portion is conveyed by chutes to the main tunnel and trammed to the mill, which is owned by the company, for the reduction of the mine output. The values contained in the ore are gold and silver with a small percentage of copper. The property is under the management of C. E. Morris and C. E. Drackert, employing 20 men when in operation.

The Groundhog Claim.

The Groundhog claim has been under lease to Charles Dracket & Co. during the year. It has been developed by a tunnel that has reached a length of 600 feet, several extensive ore bodies having been developed carrying high values in gold, the ore being a sulphide in character. Extracting the ore is the principal work at present and several shipments have been made.

The Easton Mine.

The Easton group of claims, located seven miles south of Virginia City, has been operated under the supervision of J. H. Pankey. The property has been extensively developed during the year and employs 60 men. Two thousand feet of development has been accomplished and several large ore bodies have been discovered. The shaft, which is 500 feet in depth below the tunnel, has been unwatered and the ex-

traction of ore has been at that depth. The capacity of the mill has been increased for the reduction of the mine output, the entire plant being equipped with electric power. The property has a greater tonnage of ore developed than at any time in its history. Values are gold and silver.

The Edgerton Mine.

C. S. Bartoglo is developing a very promising claim in the Silver Star mining district. A tunnel has been driven to a length of 800 feet, cutting several promising ore bodies carrying free milling gold. A five ton mill has been erected to test the product of the mine, with satisfactory results.

The Bell Mine.

This group consists of four claims south of Virginia City. Operations are conducted through a series of tunnels which have reached lengths of 700 and 500 feet, showing a well defined vein carrying silver and gold as the principal values. The old Grant mill has been overhauled and the necessary improvements have been made for the reduction of the mine output. Connections have been made between tunnels for ventilation and exit. The work is under the management of Sam Buckvich, employing 18 men.

North Star Group.

The North Star group of claims is operated by Wysburg & Co., the property being situated in the Virginia City district. Operations are conducted through a tunnel which has been driven on the vein a length of 350 feet, showing a well defined fissure which is highly mineralized carrying gold values. A winze has been sunk 50 feet below the tunnel to prove the extent and continuity of the ore body. The property is under the supervision of Edward Johnston.

The Fairview Mine.

Consists of a group of four claims located on Wisconsin Creek six miles west of Sheridan. Several tunnels have been driven on the property. A tunnel has been in construction which will cut the ore body at a much greater depth and at present is 700 feet in length. It will be extended to a point where connections will be made with the upper workings for ventilation and exit. The values contained are silver and lead. The property is under the supervision of Frederick S. Woodhull and employs 8 men.

The Prospect Mine.

The Prospect property, situated near Virginia City, has a working tunnel which has been extended on the strike a length of 1,500 feet, and it has a surface connection for exit and ventilation. The property has been a steady producer during the past two years and is operated by W. B. Right & Sons.

Green Campbell Mine.

The property of the Green Campbell Mining Co., situated at Silver Star, has been operated by a party of leasers during the year, who are conducting the principal part above the water in the tunnel level, the tunnel having a length of 800 feet. The extraction of ore from old pillars and odds and ends of stopes constitutes the principal work. Under direction of R. C. Bartell.

The Nelson Mine.

The Nelson property has been operated by Stapleton & Co. during the year. An incline shaft has been put down 100 feet on the vein and drifting to the extent of 200 feet on the vein has been accomplished, which uncovered several chutes of high grade ore carrying gold as the principle value. The property has been equipped with electric power throughout and is under the supervision of S. H. Ribbel.

The Broadway Mine.

This old property was operated almost steadily the past two years by a party of leasers. The mine is located near Silver Star. At no time has justice been done the property, as it has been operated intermittently by leasers for many years whose chief aim was to extract all the ore possible with the least cost, resulting in neglecting to timber the workings or make provisions for the future of the mine. The vein carries high values in gold. Steve Gennetti is the present operator.

The New Mine.

This property is operated by the Gold Coin Mining Co. and is in the Rochester district, James Miller being in charge of the operations. The property has been operated at intervals during the year. It has been developed by an incline shaft that has reached a depth of 300 feet, 100 feet having been sunk during 1911. The vein has been developed to the extent of

500 feet and several shipments of ore have been made which carry high values in gold.

The Hudson Mine.

The Hudson mine, situated at Silver Star, is owned by Charles Dahler and operated by the Largey estate, through an incline shaft which has reached a depth of 300 feet on the vein. The mine produced a large monthly tonnage during the year which netted a handsome profit per ton to the operators. Extensive development has been done in the mine under the supervision of John Sheehan, employing 20 men.

PARK COUNTY.

Though development has been continuous, mining has not been as active in the county as in former years. In the Jardine district, owing to litigation among the stockholders of the Kimberly Gold Mining Co., mining has not been as actively engaged in as formerly. Various strikes have been made on the tungsten vein in the district and wide interest has been aroused in that vicinity. With transportation facilities the Cooke City district will excel the entire county in production, owing to the many promising properties now being developed.

The Republic Mine.

This mine is operated by the Buffalo-Montana Mining Co. The property has been developed by tunnels that have been driven on the vein to a length of 300 and 500 feet and which extended through several extensive ore bodies carrying high values in silver and lead. The property has been operated at intervals during the past two years owing to the distance of transportation, which is 65 miles. When in operation 30 men are employed under the management of N. J. Tredinnick.

The Reward Mine.

The New World Mining & Developing Co. is exploring a group of claims in the Cooke City district. Operations are conducted through a series of tunnels which have reached a length of 700 feet, cutting a well defined vein which carries gold and copper in the vein filling. The property has been extensively developed during the year.

The Young Bonanza.

Is owned and operated by P. A. Bell & Bro. The vein has

been developed by a tunnel which has been driven 400 feet and cuts the vein at a depth of 400 feet. From the point of intersection a drift has been driven on the vein 300 feet, showing a well defined lead carrying gold and silver. The property is situated five miles north of Cooke City.

King and Queen.

The King and Queen group, operated by the Copper King Mining Co., is situated north of Cooke City. Operations are by tunnels which have been driven on the vein, showing an extensive ore body which yields fair values in gold.

The Tiger Group.

This property, operated by the Cobalt Mining Co., is under the supervision of Gus Holm. Operations are conducted through a tunnel that has reached a length of 600 feet, opening up several bodies of ore containing silver and lead values. The work has been extended 300 feet during the year, employing six men.

The Goose Lake Copper Company.

The Copper King group operated by the Goose Lake Copper Co. Operations are conducted through a tunnel which has been driven on the strike a length of 350 feet. It is under the supervision of John Martin. Some high grade ore has been cut during the development carrying copper and silver as the principal values. The veins are strong, persistent fissures in granite.

The Daisy Mine.

This group of claims is developed through a series of tunnels, the lower tunnel having been extended to a length of 700 feet. The vein which has been developed shows from three to four feet of ore which carries high values in lead and silver. The property has been developed extensively by the Bliss Mining Co.

The Crevasse Mine.

This group of mines is located in the Jardine district and is owned by W. G. Conrad. The group has been developed through a 1,200 foot tunnel and perpendicular shaft which has reached a depth of 200 feet. Openings have been made to the various workings for ventilation and escape. The ore is an iron oxide in character and its chief values are gold. A 20 stamp mill is located near the main workings which treats the mine output when in operation.

The Yellow Jacket.

The Yellow Jacket property is situated in the Cooke City district and is operated by James Hall. A tunnel has been driven on the strike a length of 400 feet, showing a well defined vein carrying lead and silver values of a concentrating character. The property has been extensively developed during the year.

POWELL COUNTY.

The greater part of the mining work done in the territory now included in Powell County during the past two years was in the nature of development. Several promising gold prospects are undergoing development in the Elliston district at Ophir, and in the Snowshoe district considerable interest has been excited by the good copper showings and several properties were tested in a small way. The Helmville and Ovando districts also received some attention and the work done encourages belief that in the near future many producing mines will be developed.

Elizabeth Group.

The Elizabeth group of claims is situated in the Elliston district and is developed by the owner, Joseph Lupien. The property has been developed by a 200 foot tunnel driven on the vein, cutting several deposits of ore which have been shipped and show high values in silver and lead.

The Emery Mine.

The Emery mine, located nine miles northwest of Deer Lodge, has been operated at intervals during the year by leasers. Ore extraction is the principal work carried on at the property. Regular shipments are made to East Helena.

The Little Dandy Mine.

This group of eleven claims is located three miles southeast of Garnet and is operated by the Ohio Developing Co., of which E. H. McDonald is manager and M. J. Sullivan foreman. The development consists of a series of tunnels ranging in length from 700 to 1,100 feet, on the veins. Connections are made between the various tunnels for ventilation and escape. The vertical depth is 500 feet. Developing the vein has been carried on extensively during the year, several extensive ore bodies having been discovered in a well defined fissure vein carrying high values in gold.

The Ophir Mine.

This property is situated at Blackfoot City. A two compartment shaft has been sunk to a depth of 200 feet, levels having been opened on the one and two hundred foot openings, showing a well defined ore body carrying commercial values in gold and copper. The property has been equipped with a steam hoist and is under the supervision of M. A. Mitchell.

The Black Jack.

The Black Jack Mining Co. is developing a very promising group of claims in the Elliston mining district. The development consists of a shaft 125 feet in depth on the vein which shows a well defined ore body carrying silver and lead. Several shipments have been made. The property is under the supervision of Charles Weston and employs six men.

The Julia Mine.

This property, operated by the Montana-Clinton Copper Mining Co., of which C. D. Friedericks is manager and Andrew Stewart superintendent, employs 20 men. The operations are conducted through a 400 foot tunnel. A two compartment shaft has been sunk to a depth of 200 feet, which is 100 feet below the lowest workings from the tunnel. Ore extraction has been carried on, the ore carrying high values in silver, lead and copper at that depth. The vein shows permanency as far as developed. All precautions have been taken to avoid accidents. The property has been equipped with a steam hoist.

Ellen Churchill Group.

This group consists of six claims which are developed by the Twin City Mining Co., under the management of Sam Moore, and is located in the Elliston mining district. Fourteen men are employed. An incline shaft has been sunk to a depth of 200 feet during the year and exploring the vein at that depth has been in progress, showing a width of from 12 to 14 feet, carrying silver, lead and copper with a small percentage of gold. The shaft has been equipped with a steam hoist of sufficient horse power for that depth.

The Flagstaff Mine.

This property, of the Elliston Copper Mining Co., is located on Snowshoe creek, ten miles north of Elliston. Operations are conducted through a series of tunnels ranging from 200 to 400 feet in length. The formation of the country is lime

and the ore occurs in large deposits containing gold and copper. All provisions are made for the protection of the men employed.

The B. and B. Mine.

This property has been developed very extensively during the present year by the owner, J. P. Brusezite, the tunnel having been extended to a length of 400 feet, uncovering a well defined ore body showing values in copper and gold. Development work has been made secure by timbering as far as developed. The property has been taken over by the Issuing Syndicate and is under the supervision of G. T. Brown.

The Penmount Mine.

This property is situated three miles south of Elliston and is operated by the Penmount Mining Co., under the supervision of Thomas Rogers. The exploration work which has been done is conducted through tunnels that have reached a length of 150 and 300 feet on the vein carrying lead and silver. The vein shows permanency as far as developed.

The Birdseye Mine.

The Birdseye group, situated in Nevada Gulch, is operated by a crosscut tunnel which has been driven a length of 600 feet, at which point the vein has been cut, driving on the vein to the extent of 300 feet where ore extraction has been made. A five stamp mill has been installed for a test, to determine the process to be installed later for the greater saving of the values, which are principally gold. The property is operated by Wm. Finn.

RAVALLI COUNTY.

Much attention has been attracted to several districts in the Bitter Root range of mountains in the vicinity of Florence. Several promising properties are being developed with satisfactory results. The metalliferous veins afford the most attractive possibilities for developing large producing mines, a great many of the veins being of a concentrating character with values in both copper and lead.

The Gold Bug.

The Montana Mines Co. is developing a group of claims situated seven miles east of Florence under the management of E. L. Fredericks. The ore contained in the group is a free

millling gold, in a true fissure vein, which is characteristic of the country, the discovery being made on the mountain. A tunnel 800 feet in length is in course of construction to cut the vein at that point, which will result in a great saving in transportation of the mine product.

The Ore Finder Mine.

The property operated by the Ore Finder Mining Co. is located three miles south of Victor. It has been developed to a depth of 200 feet by a perpendicular shaft of two compartments. Seven hundred feet have been explored on the strike of the vein, revealing ore bodies carrying gold, silver and copper values. The equipment consists of a steam hoisting plant. John Hickey, manager.

The Curlew Mine.

The Curlew group, consisting of seven adjoining claims, is situated four miles northwest of Victor and is owned by A. M. Holter. Thomas Cown is superintendent. The property has been operated at intervals during the year by leasers. The principal part of the work has been done through a tunnel which was driven to cut the main workings on the strike of the vein. The ore extracted was treated in the concentrator on the property and carried high values in gold and copper.

SANDERS COUNTY.

Mining in Sanders County has been very active during the year and several promising properties are in course of development. Each district, as far as developed, shows a condition of a very encouraging nature. The districts are heavily mineralized and show permanency in every particular. A great many promising discoveries are being made in the Mission range of mountains, formerly in the Reservation, the greater portion now being in Sanders County. The mineral possibilities of Sanders County are great and development will be made with the practical assurance of success.

The Shamrock Mine.

The Shamrock mine, owned by the Florence Mine & Developing Co., is operated through a series of tunnels, the longest of which is over 1,000 feet, 350 on the vein, and several large bodies of ore carrying gold and silver have been opened in the development. The property has been operated

at intervals, making mill tests in order to ascertain the methods for the saving of the values contained in the ore. The property is under the management of J. A. Houghton.

Arizona Mine.

The Arizona is situated eight miles north of Trout, on what is known as Trout Creek. A tunnel has been driven to a length of 400 feet, cutting the country, to intersect the vein at a depth of 700 feet from the apex, and shows very high values in gold, silver and copper. A proper reduction plant will be constructed on the property for the reduction of the second grade material, the high grades being sent to the smelter direct. The property is under the supervision of Perry A. Heater, manager of the Florence Developing Co.

Dominion Group.

The Dominion group consists of four claims owned by the Vermillion Gold & Silver Mining Co., and is situated thirteen miles up Vermillion Creek. The property has been developed by a series of tunnels and shafts being driven on the claims for development purposes. The lower tunnel is driven on the vein a length of 300 feet, showing a well defined vein in a blanket formation carrying high values in gold, lead and copper, gold predominating. The vein lies flat between the formation, which is slate and altered lime. The property has all the indications of being in the producing class in the near future. From six to eight men are employed.

The Standard Mine.

Is operated by the Standard Mining Co. and situated eleven miles south of Thompson Falls. The principal part of the development is through a 1,900 foot crosscut tunnel that intersects the vein at a depth of 900 feet. The group is traversed by several fissure veins that are well defined. The lead has been opened from the point of intersection, opening some good bodies of shipping ore of a silver-lead character. The property has been operated at intervals during the past few years and is equipped with a Lyner compressor, water power being used for the operation of the wheel for ventilating purposes. The property is under the management of W. L. Mahoney.

Harfort Group.

The Gold Hill Mining Co. is developing a promising group of claims on Vermillion Creek, seven miles north of Trout

Creek, under the supervision of Perry A. Heater, employing 20 men. The operations are conducted through a tunnel that has been driven on the vein to length of 300 feet, showing a well defined ore body of a cyaniding character, the principal values being gold. A 50 ton mill has been constructed for the reduction of the mines output. The formation is an altered granite showing the vein to be very extensive on its strike.

St. Regis Mine.

This property has been operated by the St. Regis Copper Mining Co., and is situated three miles north of Donlon. Development has been carried on through a series of tunnels, 400 and 500 feet long, in which several well defined ore bodies have been discovered carrying high values in copper and silver. G. F. Franklin is in charge of the development work.

The Copper Bell.

Is the property of the St. Regis Mining Co. and is located eleven miles northeast of St. Regis. The property has been opened by tunnels which have reached a length of 600 and 800 feet, cutting the formation. The veins have been opened for a distance of 500 feet, exposing several large ore bodies. The principal values are copper and gold. The country formation is quartzite and schist. The property is under the supervision of Peter Stroble.

The Broken Hill.

This property, situated nine miles west of Iron Mountain, in the district between Sanders and Missoula counties, is operated through several tunnels, the lower tunnels having been driven for 450 and 700 feet. Connections have been made between the various workings which afford ventilation and exit to surface. The character of the ore is an oxide of iron, carrying as much as 80 per-cent excess of iron and a fair value in gold.

Gilbert Mine.

This property, situated seven miles south of Thompson Falls, is owned by the Denver & Gilbert Mining Co., F. A. Gilbert manager, and employs seven men. The property has been developed by tunnels having a length of 800 feet, 300 feet having been accomplished during the year and uncovering some very high grade material carrying gold and silver. The work has been conducted in a safe manner as far as developed.

Arlington Mine.

This property, operated by the Arlington Mining Co., is situated on Prospect Creek, south of Thompson Falls. A tunnel has reached a length of 500 feet, cutting the country, in which several veins carrying high values in silver and gold were discovered. The veins are true fissures, which is characteristic of the district. Further developments will be made to prove the continuity of the ore bodies. The property is under the management of J. F. Fisher.

The Eagle Mountain.

The Eagle Mountain mine, situated on Prospect Creek, seven miles south of Thompson Falls, has been operated by a tunnel, cutting the country for a length of 1,000 feet to where the vein has been exposed, uncovering several well defined ore bodies carrying lead-silver values of a concentrating character. The formation of the country is quartzite. The property has been developed extensively under the supervision of H. McGillis.

SWEET GRASS COUNTY.

The mineral resources of Sweet Grass County are, as yet, undeveloped. However there has been sufficient prospecting done to demonstrate the fact that large mineral deposits exist in the mountains in both the northern and southern parts of the county. Many veins bearing silver, lead and gold have been found in the Crazy Mountains, around the headwaters of Big Timber and Sweet Grass creeks, some thirty miles north of the town of Big Timber. Ore has been shipped from several of these prospects and it has been demonstrated that several good paying mines could be opened up in that locality were it not for the expense of getting the ore to the railroad and the high rates of transportation after reaching the same. The most extensive mineral belts, however, are found in the southern part of the county. Going up Boulder River, which empties into the Yellowstone from the south, near the town of Big Timber, valuable coal deposits have been located some fifteen miles south of Big Timber. The Boulder River leaves the mountains about thirty miles south of Big Timber. At this point, known as the "Contact District," are found many veins of gold bearing quartz. Quite a little money has been expended and several very promising prospects are found in this

vicinity. From Contact to Independence, a distance of about thirty-five miles, the whole country, which is very mountainous, is interlaced with mineral bearing veins, and prospect holes may be seen from any point along the road running up the Boulder, upon the dumps of which can be found ore containing precious metals of one or more kinds. Near Hicks Park, which is about twenty miles south of Contact, are found some very high grade copper leads, some ten or fifteen of which have been patented and are now lying there waiting for railroad transportation in order to successfully work and develop the same. At the head of the Boulder River is found the old Independence Mining District, in which both placer and gold bearing quartz are found quite extensively. Here, again, the difficulties of transportation are the only drawbacks to the successful operation of the mines. From the headwaters of the Boulder it is only a short distance to the well known Cooke City Mining District, which is situated in Park County. Surveys made a few years ago have established the fact that the most feasible route for railroad into Cooke City is from Big Timber up the Boulder, the same being a water grade practically all the way. With a railroad running up the Boulder and into Cooke City, there can be not question but what one of the greatest districts in the state, extending from Contact to Cooke City, will soon be developed and many new mines yet undiscovered will be opened up. Also on the headwaters of Deer Creek, running into the Yellowstone from the south, are found many indications of copper, and marble quarries have been located in this vicinity. Most of the mines that have been located and prospected to any extent are situated a long distance from the railroad, among high and precipitous mountains, making it very expensive and difficult to work the same until such time as electric or steam railways have made it possible to procure cheaper transportation. When that time comes, with numerous waterfalls on the Boulder River for electrical power, and one of the greatest timber belts in the state, the southern half of Sweet Grass County will be one of the most prosperous mining districts of Montana.

GALLATIN COUNTY.

The Gallatin County Gold Mining Co., located eighteen miles from Manhattan, is operating a group of five claims on which several shallow shafts have been sunk on the veins, besides numerous short tunnels, surface cuts and pits, along the outcrop for a length of 3,000 feet, demonstrating the continuity of the veins. A tunnel has been run, cutting the country, which has reached a length of 450 feet, cutting a well defined vein having a width of from twelve to fifteen feet, which is highly mineralized. A second tunnel will be constructed lower down the mountain which will intersect the vein at a much greater depth. Power is to be installed for the operation of machine drills. The properties under development are owned by J. H. Congdon & Co., of Manhattan.

Gallatin County has not been receiving the attention of the prospector or capitalist which its merits warrant. There are several mineralized districts within the boundaries of this county.

REPORT OF DEPUTY STATE MINE INSPECTOR.

Butte, Montana, December 1, 1912.

William Walsh,
State Inspector of Mines,
Helena, Mont.

Dear Sir—I herewith submit for your approval my report of mines examined together with a list of fatal and non-fatal accidents for the fiscal year ending November 30th, 1911 and 1912, respectively.

Respectfully yours,

W. B. OREM,
Deputy State Mine Inspector.

SILVER BOW COUNTY.

In the beginning of the year 1912, production was somewhat curtailed owing to the low price of copper, but within the last eight months they have been running steadily, just doing necessary improvements. It has principally consisted of changing hoisting engines from steam to air, but when one mine or two closed on account of this change, production was increased in others to make up for those closed, making the production nearly normal, which is about 15,000 tons per day, and giving employment to over 12,000 men, which represents over \$15,000,000.00 pay roll per month of real money to be distributed to all classes, business people in Butte and the state in general. The largest amount of money paid for the number of men employed in the world.

There is no doubt that Butte is the greatest mining camp on earth, considering what it has to do to compete in an open market with their product, where mines are worked with cheaper labor and longer hours, it is a difficult proposition. The operators surely have to understand their business to obtain the results.

These men handling the properties in this district understand their business from A to Z. It is doubtful if there is an abler class of mining men in the country than those employed in Butte, in all lines pertaining to mining. But nature has been good to Old Butte. So have John D. Ryan and John G. Maroney. With the both combined they have given to Montana one of the greatest water power systems of the country

to generate electric power, which consists of the Missouri River Power Co., the Great Falls Power Co., Big Hole Power Co., Helena Power Co., and the Madison Power Co., within a distance varying from 50 to 180 miles of us. They have recently organized a company for One Hundred Million Dollars to develop this wonderful enterprise, which is doing more to reduce the cost of mining than any one thing. Within the next six months all the hoisting engines of Butte will be running on air instead of steam, which is almost two-thirds cheaper than steam, which is one of the principal benefactors in lowering the cost of mining. All mining and smelting plants are now using electric power. It is of great benefit in regard to air, doing away with the heat caused by steam. Another reason that I believe Butte has the best class of miners in the mining world: They are able to do a shift's work quicker and better than any that I have seen. The reason for this is, a man well paid is much better than a man half paid. He has something to show for his work. And the company is also the gainer; and miners have better accommodations in Butte than any other mining camp, better at the mine and at home both. At the mine they have fine dries with individual lockers and an ample supply of shower baths to supply the men employed.

The Badger is one of the largest mines in the district, being practically a new mine. A year ago it was working about 100 men and now it has three times that many. It seems that the Butte camp still has a faculty of getting new mines and never losing an old one. They are all producers. The Tuolumne has been producing considerable ore for the last year and is numbered as one of the new ones. Within the last three years Butte has become a zinc producer. There are several mines in this camp that have a fine zinc showing that are not working at the present, but when the mills that have been built this last year prove that their treatment is a success, there will be no doubt that Butte will be one of the largest zinc producing districts in the United States. It is said by a great many mining men the Butte Superior is now one of the largest zinc mines in the country. Only a few years ago they were working 175 men. Now, they employ 800. They have constructed one of the most up-to-date mills for the treatment of their product which will have a capacity of from 1,000 to 1,500

tons per day. They have enormous bodies of ore blocked out.

The Elm Orlu is a zinc mine of some prominence having considerable ore in sight. It also has some copper values. The Clark interests are now building a zinc mill near Timbered Butte for the treatment of their ore, which will be completed early in the spring.

The Davis-Daly is shipping considerable ore which is copper. Have a good showing on the 1,900 foot level and intend increasing their output. There never was a time in the history of Butte that the prospects for future development looked brighter. North, the Butte Superior is going to do a lot of work from the Milwaukee shaft in the way of cross cutting.

The Rainbow Development Co. intends sinking a shaft to develop a lot of ground recently acquired by their representatives. This is a very strong company with some of the great mining men of the country interested and I hope their efforts will be successful. It is not many years ago when a great many people thought the Speculator was the limit north for copper. But like a great many other things, it was only a dream. It is likely that when the Creator made this earth, He did not understand it, so it is up to the men engaged in the mining business to demonstrate themselves. Ore is where you find it. Experts are all right, but they have made some awful mistakes. I have known of several large mines that have been turned down by them that today are among our large producers. An old time miner was once asked what constituted an expert. In reply he said, "Generally a fine-looking young man with a corduroy suit and high shoes and a little candle grease distributed over them."

East, the Bullwhacker is putting in a leaching plant for the treatment of that product, which is about one hundred tons per day.

The Brundy group are doing all kinds of development work and working a large crew of men. They are also working on a leaching proposition. From the showing on the east side, within the next year it is more than likely that they will have some producing mines besides the East Butte.

The Cole interest is going to sink the Butte and London shaft to the 1,800 and do 400 feet of drifting and cross cutting which is likely to show up some valuable veins.

West Butte Zenith Mining Co. is going to do a lot of work

down at Silver Bow Junction, in the way of sinking a shaft 500 feet deep and doing a lot of cross cutting.

The Anaconda Copper Mining Co.'s mines are always under a systematic course of development and have proven beyond a doubt that the bottom of the Butte mines is a long ways distant. They have good veins opened up on the lower levels, which is 2,800 feet, showing good values. They did 37 miles of development last year. Ben Thayer, vice-president of the company, in his last inspection said that the mines were never in better condition in regard to ore generally than at the present time.

Ventilation.

The greatest problem to be considered in the great depths is the matter of proper ventilation. From my observation of the different mines I am of the opinion that the correct way of getting good air into mines is by air shafts separate entirely from the hoisting shaft and keeping these air connections as deep as the main working shaft. Two separate connections to the bottom level of the mine will secure circulation that cannot be secured by any other means. Any one familiar with the working of mines knows it is impossible to ventilate a mine if your air shaft is not kept as deep as your working shaft. With the proper equipment on air shafts you are bound to get returns. Where air shafts are carried down from the surface and working with the connections made in different mines give a circulation of pure air. When two shafts are sunk or raised to a common depth as a consequence one of them will be an upcast, at various mines where connections by means of air and development shaft have been made to the lowest level, the ventilation is all that can be expected. I believe every mine should have its own air shaft and not depend upon connections with other mines. Air shafts should be sunk or raised in solid ground away from mine workings, and connections made with air shafts by cross cutting. By placing doors in these cross cuts it is possible to convey air through any part of the mine. In some instances connections made with other mines workings, as far as ventilation is concerned, are a detriment rather than a benefit, as the air so received may have become impure for the use in other workings. While it appears to be good air it is not, the effect is soon noticed on one working. Connections with other prop-

erties are necessary for the safety of men. While most mines have several escapement shafts, it is not always possible to have men located so that they are out of danger. If these connections are considered detrimental to other properties, the connections can be closed by doors to be used in a case of necessity. All companies realize that it is impossible to get the same amount of work out of men when the air is poor, and therefore it is to their advantage to secure the best possible ventilation. The cost of making proper air connections is soon made up in labor. The large companies are installing electric fans on nearly all their air shafts with good results. The Rarus has a Buffalo fan installed at the Rarus shaft, which is 1,600 feet deep, pulling out 180,000 cubic feet of air per minute. This causes a good circulation through the mine. They also have one on the Cora shaft which is doing good work for the Diamond and East Grey Rock, having a capacity of 180,000 cubic feet per minute. This is taking out a great deal of hot air from the Diamond.

The Pennsylvania has one located on the 1,200 foot level of their air shaft pulling down the shaft. A drift connecting with the fan is $7\frac{1}{2}$ feet high and 5 feet wide, distributing 50,000 cubic feet of pure air through the mine. Gambetta No. 1 and No. 2 have fans handling about 30,000 cubic feet of air per minute, having a capacity of 60,000. They are also installing a large one at the Green Mountain, Gagnon and Original. The Parnell has one of 180,000 cubic feet. These fans are giving good results.

The Speculator has two separate air shafts. The Gem is down to the 2,000. Granite Mountain down to the 2,200 and shortly will be connected with the 2,800. These two shafts have been sunk within the last few years for the purpose of ventilation.

The High Ore air shaft, 2,580 feet, three compartments, which is doing great deal in the matter of ventilation. This shaft has worked wonders in the High Ore mine. It is only a matter of a few months when this will be connected to the 2,800.

The Mountain View air shaft, 2,000 feet deep, three compartments, is also one of the shafts sunk for ventilating purposes in the last five or six years.

The Belmont is sunk to the 2,400, of which about 1,200 feet

has been sunk in the last two or three years, and has done wonders in the way of ventilation for the Anaconda properties.

The Leonard mine has three shafts; the main working shaft is 2,000 feet deep and has been a great benefit to other portions of the mine. Their old shaft has reached the depth of 2,000 feet and is connected on various levels with the new shaft. They also have sunk an air shaft to the depth of 1,800 feet and soon will be connected with the 2,000. This gives this mine three shafts nearly to the bottom of the mine.

The Tramway mine has just completed a new air shaft to the 1,500 and intends taking it down to the lower levels. This shaft is about the center of their ore body, and when completed it is going to be a great benefit in the matter of ventilation. They also have a large fan on the 1,700 working shaft which is pulling down and distributing pure air through their mine.

The Gagnon air shaft has reached a depth of 2,000 feet, three compartments, being connected to the Gagnon and Original is going to be a great benefit to the two mines in the matter of ventilation.

Mountain Con mine is connected to the Buffalo, also to the 2,200 of the Green Mountain.

West Colusa has the Comanche shaft down to the 1,800; also has sunk the Alex Scott shaft 400 feet, which is 1,600 feet, and connected it for the purpose of ventilating the West Colusa mine.

The law requiring sanitary care has given good results in regard to air and conditions in general.

All the large companies have installed for hoisting ore, which will increase the production of the property. The method of hoisting the skips is considered the most economical. The skips have a capacity of from one to six and six to eight tons, and are attached either above or below the cages. The skip chutes are cut at the different stations, having a capacity of any desired tonnage. Men, horses and electric motors are employed in tramming ore from the different stopes to the skip chutes. The mouths of the skip chutes open into the shaft, and the loading of the ore into the hoisting skip is done by station tenders.

Another one of the improvements is the installing of telephones in the various mines, so in case of emergency they can

be used by any of the bosses or men. They also have a telephone station of the 1,200 that you can call up any place in the state. This is situated in the Leonard mine. This is one of the most important improvements of the year, saving many unnecessary trips to the surface. These are directly connected to all the foremen's offices and the surface plants.

Butte Hoist and Compressor Plant.

This Butte Hoist and Compressor Plant furnishes all the air for the stationary engines at the various mines. This plant consists of three electric cross compound Nordberg variable capacity compressors, 15x39 cylinders, of 75,000 cubic feet of air capacity per minute, each aggregating 32,500 cubic feet of air per minute. These compressors are driven by 1,200 H. P. motors of synchronous type, built by the Westinghouse Company, 24 air receivers 10 feet diameter by 30 feet high, and used for storage. These receivers aggregate 56,548 cubic feet, which at 90 pounds pressure is equal to 480,000 cubic feet of air, at this elevation of Butte. In addition to these, 10 receivers 10 feet in diameter by 56 feet 8 inches long, which will be used in connection with a steel tank 100 feet in diameter by 20 feet deep for storage and hydrostatic pressure. This tank has a capacity of 500,000 gallons of water, and is connected with a receiver by a 42 inch pipe. It is located at an elevation of 208 feet above the receivers, giving a pressure of 90 pounds. If more air is drawn from the receiver than the compressors can supply, the water will flow into the receiver, keeping the pressure up to 90 pounds as long as there is any water in the tank. It is intended to use this plant for all hoisting engines, which are being connected as fast as possible, doing away with steam and using air, which is almost a third cheaper than horse power and steam. At each mine a 50 H. P. re-heating boiler will be located which will be operated under pressure 200 pounds of steam. At this pressure, with a temperature of 387 degrees F., will circulate through a sectional surface of special design and 50 inches in diameter by 25 feet high located near the hoist. The air before going to the engine will be heated to 350 degrees F.

All the principal mines in this district have installed safety devices on their hoisting engines, which will prevent the cages from being hoisted into the sheaves. The device works automatically on brakes, so that when the cage is within 100 feet

of the collar of the shaft, going at too high a rate of speed, the brakes are set, stopping the cage within 75 or 100 feet after the device works. The device is very simple; three cylinders are set directly behind the brakes, with an attachment on the indicator to show the position of the cage in the shaft. When it is close to the surface going at a dangerous rate of speed, the steam is forced into the cylinder, which causes the brakes to be set thereby stopping the cage. In all mines where the device is being installed it has proven successful.

In regard to accidents, the general public seem to be under the impression that there are a great many men being killed, but when you realize that there are nearly 10,000 men employed underground in Butte, there is not so many. From the time the men employed in mines step on the cage to the time they come off, there is more or less danger, for everything in the line of mine work is dangerous and there is no one cause for accidents. They happen in every imaginable way that they can, and with all precautions it seems to be impossible to stop all of them. With all labor troubles settled in regard to mining, there is no question but what the year 1913 will be one of the banner years for the Butte District.

SILVER BOW COUNTY.

The mines operated by the Anaconda Copper Mining Co. during the year 1912 are the Anaconda, Mountain Con, J. I. C., Original, Pauline, Gagnon, Silver Bow, Tramway, Leonard, Badger, State, Neversweat, Belmont, Stewart, Parrot, West Grey Rock, Berkley, Mountain View, West Colusa, Diamond, St. Lawrence, High Ore, Right Bower, Moonlight, Little Mina, East Grey Rock, Pennsylvania and East Colusa. Con F. Kelly, General Manager; John Gillis, General Superintendent; B. H. Dunshee, Assistant Superintendent; J. C. Adams and C. W. Goodale, Superintendents. Number of men employed, 7,339 miners, 1,699 surface men; total, 9,038. Miscellaneous, 3,175 men. Grand total, 12,213.

Anaconda Mine.

There are 341 miners and 180 surface men employed in this mine. Three compartment shaft down to the 2,400 level, 50 feet having been sunk this year. Owing to recent fires, the shaft has been timbered nearly 2,400 feet within the last few years. There is electric bell communication with all parts of

the working and the sills. The sills and drifts are also lighted with electricity. The mine is timbered with round and square timbers, framed into square sets. The system of back filling is used in this mine. The chute is made of round and generally notched timbers. They are known as log cabin chutes. The system is safe enough where the walls are hard and the ground is generally good. It is necessary to keep this kind of mining filled closely, having the slopes well picked down and the backs not too hard. Ore can be cheaply handled under this system with no timbers and plenty of room the chutes can be placed close together, the shovelers unobstructed room to work with and consequently increasing the ore supplies to the chutes. There have been few accidents under this system for the last few years. This mine is large and requires three foremen, Mr. Dick Welch and Jim Martin being foremen on the main ledge, Denny Kennedy on the south ledge. The mine is equipped with two double deck cages eight ton skips attached and 32x72 cylinder copper valve Corliss engine, built by the Montana Iron Works, 1½x7 flat cable. The skips are loaded from different levels and hoisted to the surface and dumped automatically into ore bins. Most of the ore is hauled from the stopes by motors and horses. The horses worked in the mines are seldom brought to the surface, they remain in fine condition. This mine is fairly ventilated and connections from the Neversweat, St. Lawrence, south shaft No. 9, Rose shaft and south ledge with three or four intermediate shafts to the 1,400. This mine has a dry for the accommodation of 600 men, having 32 shower baths. This is one of the most essential things for the men, allows them to go home clean and dry, and it maintains and improves their physical condition.

The Neversweat Mine.

The Neversweat mine is operated under the superintendency of J. P. O'Neill, having 250 miners and 75 top men. The main shaft of this mine is 2,500 feet. The shaft has three compartments, is fitted with electric bells with all levels and drifts lighted with electricity. The equipment is 32x72 cylinder Union Iron Works engine, 1½x7 flat cable, 2 double decked cages with eight ton skips attached. The ore is handled practically in the same manner as the Anaconda mine. The motor power, lighting, etc., is secured from the transmission wires

of different power companies, whose generating plants are located at Great Falls and the Missouri River, near Helena. The power used for drills is furnished by five Ingersol Sargent Compressors. This mine is fairly ventilated with the various connections they have with different mines, being connected with the Moonlight, Colussa Parrot and Parrot. This mine is timbered with round and square timber, framed into square sets. The system of back filling is also used. The plant of this mine also furnishes the Anaconda, St. Lawrence and Moonlight with air for drilling purposes. William Murray, foreman.

St. Lawrence Mine.

J. P. O'Neill, Superintendent; Mr. Dan Crowley, Foreman. There are 344 miners employed, 44 surface men. The ventilation of this mine is excellent, having connections with the Mountain View, Pennsylvania, Anaconda, Neversweat, also the Sweat Metcalf raise from the surface. This mine is well timbered and in good condition. It is also provided with a dry, which will accomodate 600 men. The working shaft is 2,400 feet deep, 276 being sunk in 1912. This shaft is equipped with a system of electric bells, all drifts and sills are lighted with electricity. The engine is a 32x72 cylinder, made by the Montana Iron Works. The cable is 1x7 inches thick, and two double deck cages, eight ton skips attached. The timbering is done with square and round timbers, the back filling system is used also.

Mountain Con Mine.

The Mountain Con mine employs 380 miners and 75 top men. James Brenan is Foreman. Three compartment shaft down to the 2,500, 185 feet being sunk in 1912. The shaft is equipped with a 26x72 Union Works engine, 1½x8 flat cable, equipped with four double deck cages. This mine is timbered with round and square timbers. This mine has been greatly benefited in the recent year, installing a large fan on the Green Mountain shaft, which has helped the mine wonderfully in all working places.

Bell Mine.

The Bell mine is 1,600 feet deep, three compartments equipped with two double deck cages 1½x6 flat cable. The engine is 28x40, made by Chicago Iron Works. This mine is timbered with round and square timbers, and is worked through the Diamond shaft. Ed Grimes, Superintendent; Con O'Neill, Foreman.

The High Ore Mine.

The High Ore mine has a three compartment shaft down 2,881 feet, and is given credit as being one of the best shafts in the Butte camp. The equipment consists of a 32x72 cylinder engine, made by the Montana Iron Works. Two four decked cages 1½x7 flat cable. They also change these decks to skips after lowering the shift. Has a through system of electric call bells, the ore is trammed with horses and motor. The mine is timbered with round timber and square. It is one of the best ventilated mines in the district. They also have the Modoc air shaft down to the 2,400 of which 225 feet was sunk in 1912, this being one of their main air shafts, and it is a great help in the matter of ventilation. There is an extensive pumping plant attached to this mine, aside from having its own water it handles that of the Anaconda, Washoe and Parrot mines. The plant consists of three Dixon pumps of 1,500 gallons per minute, located on the 2,200 foot level, which hoists water to the 1,600 foot level, where there are three similar sets of pumps that raise the water to the 900 foot level, where another set of pumps of the same capacity raises the water to the 1,500 foot level, where there is an outlet that conducts the water to Meaderville, where it is used for precipitating. In the last year these pumps have all been changed from steam to electric power, also the engine has been remodeled for air instead of steam. The foreman of this mine is Charles Ferns, employs 679 miners, 101 surface men.

The J. I. C. Mine.

The J. I. C. Mine, Jack Andrews, Foreman, 43 miners, 12 surface men. Main shaft of three compartments, 1,000 feet deep, equipped with electric engine, one inch round cable. They are not working below the 900.

Belmont Mine.

The Belmont mine, Jack Andrews, foreman, 109 men employed, 28 surface men. Three compartment shaft down to the 2,400 foot level. This shaft is equipped with a Webster, Camp & Lane engine, 38x72 cylinder, flat cable, 1½x7 inch. Company intends making this one of their permanent working shafts for the Anaconda mine. It is connected with the 1,600, 2,000 and 2,400 foot levels of the Anaconda mine and it is a great help to that mine in the matter of ventilation.

Right Bower Mine.

The Right Bower mine, Ed. Finnegan, Foreman, employs 10 miners and 2 surface men. Shaft down to 550 foot level, three compartments. Also connected with the Ballakalva and High Ore.

Original Mine.

The Original mine, Jerry Sullivan, Superintendent, Dennis Shea, Foreman, miners 565, surface men 82. Main shaft is down 2,400 feet. The workings are equipped with a Nordberg engine, 32x72 cylinder, 1½ round cable, two double deck cages with seven ton skips attached. The electric call bell system is in use. The cages are cased in with iron on three sides only hoisting from one side of the shaft. The tramming is done by men and motors. This mine is timbered with round and square timbers and is the main hoisting shaft for the workings of the Gagnon levels, and since the Anaconda company took control of this mine, it is greatly benefited in the way of ventilation by the different connections of the Gagnon and West Stewart. Also has some electric fans in use.

The West Stewart Mine.

The West Stewart mine, Dan Griffin, Superintendent, Mr. John Henrietta, foreman, employs 479 miners, 52 surface men. The shaft is 2,500 feet deep, 173 feet being sunk in 1912. This shaft is equipped with a 32x72 Nordberg engine, 1½ round cable, 3 double deck cages, 7 ton skips attached. Electric call system. This mine is timbered with round and square timbers, well filled and in good condition. This mine is greatly benefited by connections it has with the Little Mina, Parrot and East Stewart. The Little Mina ore and Clear Grit are worked through this shaft also.

The Diamond Mine.

The Diamond mine is equipped with a 32x72 cylinder engine, 1½x7 inch cable with 8 tons skips. When lowering and hoisting men two four deck cages are used, and then changed when hoisting rock to one deck and a skip. The main shaft is 2,800 feet deep, three compartments, electric call system is used. This mine employs 520 miners, 85 surface men. The timbering is done with square sets and round timber. The stopes are well filled and the mine is in good condition. The ventilation is greatly improved, being connected with the West Grey Rock, Green Mountain, Mountain Con, Cora and Badger

State. Within the recent year this engine has been remodeled and changed from steam to air. Ed Grimes is Superintendent, Jack Dempsey, Foreman.

Moonlight Mine.

This is one of the best timbered mines in the district and also well filled. The ventilation is good with the air connections of the Neversweat, Anaconda and Parrot. The main shaft has three compartments down to the 1,700, 202 feet being sunk in 1912. The shaft is equipped with a Dixon engine, 20x48 cylinder, flat cable, $1\frac{1}{2}$ x6 inch, 2 double decked cages, electric call bell system. Timbering is round and square set. 232 miners and 36 topmen. W. H. Price, Forman.

The Poullin Mine.

The main shaft of this mine is down 1,500 feet and at present no work is being done below the 900. The air in this mine is good, being connected with the Mountain Con and other mines. The Stella shaft is down to the 800 foot level, which is used for an air shaft. The property is equipped with a 14x18 engine, $1\frac{1}{8}$ inch round cable, two double deck cages. Mr. Peters, Foreman. Men employed, 225 miners, 43 topmen.

Little Mina Mine.

Dan Griffin, Superintendent, McManus, Foreman. Main shaft is 1,200 feet deep, three compartment and is equipped with a Montana Iron Works engine, 13x37 cylinder, round cable, two double deck cages. Connected with the Mountain Con, West Stewart, also worked through the West Stewart shaft.

Gagnon Mine.

The Gagnon mine, Jerry Sullivan, Superintendent, Dan Sullivan, Foreman. Main shaft down to the 2,200, three compartment equipped with a Dixon engine, 28x48 cylinder, $1\frac{1}{8}$ inch round cable, two double deck cages when lowering men, changing when hoisting rock, putting on two three ton skips. Electric call bell system is used. This mine is worked through the original. They have also sunk and raised an air shaft, three compartments, to the 2,200 foot level, 326 feet being sunk in 1912. This shaft has helped the Gagnon Mine wonderfully in the way of ventilation.

The West Grey Rock Mine.

The West Grey Rock mine, Ed Grimes, Superintendent, Mc-

Graw, Foreman, employs 162 miners, 30 surface men. Main shaft is 1,600 feet deep, of which 328 feet was sunk in 1912. The equipment consists of two double deck cages, 1 inch round cable. This mine is also connected with the Grey Rock and portions of the East Grey Rock are being worked through this shaft.

Silver Bow Mine.

This mine has a three compartment shaft, depth 1,000 feet. It has a 16x42 cylinder Allis engine, $\frac{3}{8}$ x4 inch flat rope, two single deck cages, electric bell system. This mine is well timbered and well filled. It is also connected with the Silver Bow, No. 3, Pennsylvania and Berkley. The ventilation is fairly good. The ore is trammed by horses and men. William McClain, Foreman. Men employed, 109 miners, 21 surface men. They have an 800 gallon per minute regular pump installed at the 1,000 foot level hoisting water to the surface.

The Berkley Mine.

Jack Andrews, Superintendent, McInvors, Foreman, employs 136 miners, 26 surface men. The mine has a three compartment shaft down to the 1,400, 400 feet being sunk in 1912. 18x32 Lidgerwood engine, one inch round rope, two single deck cages. This mine is timbered with both round and square timber.

The Rarus Mine.

The main shaft is 2,300 feet deep, three compartments. It is equipped with a Webster, Camp & Lane engine, 32x72 cylinder, flat cable, $\frac{3}{8}$ x7 $\frac{1}{2}$, two double deck cages with six ton skips attached. This mine is connected with different levels of the Tramway and is worked through the Tramway shaft. This shaft is a great benefit to the Tramway in the matter of ventilation.

The Tramway Mine.

Mr. George Multhorp, Superintendent, Dave Moody, Foreman. The Tramway employs 119 surface men, 481 miners. Three compartment shaft to the 2,200, 130 feet being sunk in 1912. Equipped with a 32x72 Allis-Chalmers engine, two double deck cages, eight ton skips attached. This mine has installed a large fan on the 1,700 foot level for the purpose of ventilation with a capacity of 40,000 cubic feet per minute, also connected with the Rarus and Leonard. They have just completed an air shaft east of the main shaft to the 1,800 which

will be of great benefit to them when it reaches a greater depth. Being directly in the ore zone it will surely give the results expected. They also have another air shaft down to the 1,600, connected with raises to the lower level. This shaft has an equipment of an electric fan with a capacity of 180,000 cubic feet per minute.

Mountain View Mine.

Mr. J. C. Adams, Superintendent, Dave Hendra, Foreman. Employs 658 miners, 81 topmen. Three compartment shaft down to the 2,200 foot level. Is fitted with a system of electric bells and Webster, Camp & Lane engine, 28x72, which has been remodeled from steam to air. Flat cable, 1x7 inch, two double deck cages, 6 ton skips attached. This mine is timbered with round and square timbers framed into square sets. The ventilation is fair, having connections with the West Colusa, Pennsylvania and St. Lawrence. Also connected with the High Ore on the 2,200 foot level. They have an air shaft completed to the 2,200 of which 205 feet was sunk in 1912.

Pennsylvania Mine.

Mr. J. C. Adams, Superintendent, Jim McQuay, Foreman. This mine employs 450 miners and 49 surface men. The main shaft is 2,000 feet deep of which 103 feet was sunk in 1912. Three compartment, electric bell call system. They have a 32x72 Allis-Chalmers engine which has recently been remodeled from steam to air. 1½ inch round rope, two double deck cages with 8 ton skip attached. This mine is well ventilated by a fan which is placed on the 1,200 foot level, conveying air through the different stopes. Also connected with the Mountain View and West Colusa. Have an air shaft sunk to the 1,600 and is conveyed through the mine with connections to different raises.

The Leonard Mine.

Mr. J. C. Adams, Superintendent, Tom Mitchell, Foreman. The main shaft is 2,000 feet deep, 294 feet being sunk in 1912. This mine is timbered with 12x12 and 14x14 square timber sets. The ledge being very large. The stopes in sections, they use approximately a million feet of lumber per month. There being so much timber used and requiring so much filling, it takes a large amount of air to be distributed to give sufficient ventilation. The equipment is a 32x72 Nordberg engine, single

deck cages with 8 ton skips attached. The ore is hoisted to the surface and dumped automatically into ore bins. This mine employs 522 miners, and 382 surface men. The mine has been greatly improved in regards to air since the completion of the new shaft, also retimbering the old shaft to a depth of 2,000 feet of which 196 feet have been sunk in the present year, which has been a great benefit. They have also sunk a new air shaft which has reached a depth of 1,400 feet, which will be continued down to the lower levels, giving them three sets of shafts for the one mine, which is going to give good results.

West Colusa Mine.

Mr. J. C. Adams, Superintendent, Mr. A. J. Daum, Foreman. The main shaft is 2,000 feet, 194 feet having been sunk in 1912. This mine employs 232 miners and 63 surface men. Three compartment shaft, also two three deck cages, a Nordberg engine, 30x60 cylinder, which is being remodeled from steam to air, 1½x6 inch flat cable. Electric bell system is used. The ore is trammed by motors and horses. This is one of the best ventilated large mines in the district. Is connected to the Alex-Scott, Leonard and Commanche shaft.

East Colusa Mine.

Mr. J. C. Adams, Superintendent, Mr. Joseph Richards, Foreman. This mine employs 8 surface men and 100 miners. Three compartment shaft down to the 900 foot level. Steam engine, 10x14. Single deck cage. This mine is well timbered and in fine condition.

The Badger Mine.

Mr. J. C. Adams, Superintendent, Mr. Renwaldt, Foreman. The mine employs 60 surface men and 325 miners. Main shaft is 1,800 feet deep. Allis-Chalmers engine, 32x72 cylinder, 1½x7 inch flat rope, two double deck cages. This mine is one of the new producers of the year. Have encountered large ore bodies on the 1,300 and 1,800 foot levels and this mine is considered to be one of the largest mines in operation by the company, being practically a new mine with an immense ore reserve in sight. The air is good from the connections with the Diamond, North Butte, and also an air shaft which has reached the depth of 900 feet, 507 feet being sunk in 1912 and it is the intention of the company to continue this air shaft to a greater depth.

The North Butte Mine.

The mines worked by this company are the Speculator, Edith May, Jesse, Snowball and several others, but all are being worked through the same shaft. John D. Pope, General Superintendent, Bill Webb, Foreman. They have a 32x72 cylinder, Nordberg engine, three compartment shaft to the 2,800, two double deck cages with 8 ton skips attached. This mine is timbered with 10x10 and round timber, is well filled and in good condition. This mine has been greatly benefited in the way of ventilation by the sinking of the Granite Mountain shaft, which has reached a depth of 2,200 feet, three compartments, which is conveyed to the lower levels by the means of raises. They also have a large fan at the 1,800 foot level which is pulling down pure air which is being distributed through various parts of the mine and also connected with the Badger, High Ore and have this summer made a connection on the 2,800 foot level of the High Ore. This mine employs 700 miners and 300 surface men.

The Elm Orlu Mine.

W. A. Clark, Jr., General Superintendent, Mr. Case, Foreman. This mine employs 200 miners and 25 surface men. Montana Iron Works engine, 16x37 cylinder 1½ inch round rope, two single deck cages, main shaft three compartment to the 1,400, 100 feet being sunk in 1912. This mine has large ore reserves, principally in zinc, and also some large copper values. Within the next year this mine will be one of the large producers of the district. They are now doing considerable surface work in the way of the construction of an ore house which is being built out of concrete, being the first one of the kind ever built in the district. From the general appearance it seems to be substantially built and a very neat structure. They are also building a large zinc mill out at Timbered Butte for the purpose of treating ore from this mine and the other properties belonging to the Clark interests. This mill will have a capacity of several hundred tons per day and will be completed by spring.

East Butte Mine.

East Butte Copper Mining Co. is one of the most complete plants of the district, Oscar Rohn being Superintendent and Andy Rea, Foreman. This mine employs 150 miners, 200 surface men. Shaft No. one, two compartment down to the 1,200

foot level, is equipped with a 15x30 steam engine, 1 $\frac{1}{8}$ inch round cable, two single deck cages with skips attached. No. 2 also has a three compartment shaft to the 1,200 foot level, equipped with a Griffith & Wedge engine, 16x32 cylinder, 1 1-7 inch round cable, two single deck cages with skips attached. This is the main working shaft. This mine is timbered with 10x10 round timbers and square timbers. The air is fairly good, the two shafts being connected by a 2,000 foot cross cut. This mine has a surface equipment consisting of its own smelter and all ore hoisted from the mine is treated at their own smelter. This mine, within the last two or three years, has become one of the producers of the camp and a great deal is due to Oscar Rohn, the Superintendent, who is always on the job and is considered one of the ablest mining superintendents of this district.

The Ballaklava Mine.

Mr. Newton, Superintendent. The mine employs 30 miners and 15 surface men. The shaft is 1,500 feet deep, three compartments, two single deck cages. The equipment consists of 160 H. P. hoist (electric), also one steam engine, 10x12 cylinder. This mine is connected with the Modock and West Colusa.

Butte-Superior Copper Co.

Mr. Atwater, Superintendent, Angus McCloud, Foreman. The mine employs 300 miners and 800 surface men. This company has a large amount of ground. All work has been done through the Butte-Superior shaft. The shaft has reached a depth of 1,600 feet, two single deck cages. The equipment consists of a Frazer-Chalmers engine, 20x60 cylinder. They have a Sullivan air compressor good for 12 drills, also a large boiler plant consisting of five one hundred H. P. boilers, one two hundred and fifty H. P. boiler, and have also installed an electric pump on the 1,200 foot level. This mine is considered one of the largest zinc mines. probably, in the United States. They have several million tons of ore blocked out and have recently installed one of the largest zinc mills in the state or probably in the west. It will have a capacity of from a thousand to fifteen hundred tons daily. The success of this mine is due to the staying qualities of Capt. Wolvin. Through his influence and proper management of the affairs of the company, this property is beyond a doubt one of the largest of

the kind in this district and there is no question but what this will be one of the largest dividend payers of Butte.

Alex-Scott Mine.

Mr. Stone, Superintendent, Mr. Richards, Foreman. The shaft is down 1,600 feet, three compartments, one single deck cage, one steam engine, Lidgerwood. This mine employs 63 miners and 20 surface men. This mine is connected to the West Colusa on the 1,200 and 1,400 foot levels.

Tuolummne Mine.

Superintendent, Mr. Pat Sheean, John Nenean, Foreman. This mine employs 127 miners, 19 surface men. Have installed one of the largest engines in this district, double drum, 32x42 Nordberg, which has power enough to hoist at a depth of 3,500 feet or more. This mine has also become one of the producers in the last two years. They have been doing an enormous amount of development work and have just completed a shaft to the 2,000 foot level, of which 200 feet was sunk in 1912. It is the intention of the company to do considerable development work at this depth and there is no reason to doubt but what they will get large ore reserves on the lower levels, such as they had on the upper. The history of this camp is that the ore bodies still continue with depth. There is no reason to doubt but what they will get good values.

Davis-Daly Mines.

The Davis-Daly consists of the Smoke House, Mount Moriah, Silver King and Colorado. Mr. Fisher, General Manager, Mr. William Frazier, Foreman. This mine employs about 20 top men and about 50 miners. All the work is being done through the Colorado shaft which is 1,900 feet deep, three compartments. Its equipment consists of a Lidgerwood engine 12x16 inch cylinder on each cable, two single deck cages. This mine has recently also become somewhat of a producer and it is hoped that before long it will be in the list of large producers. They deserve a lot of credit for the perseverance and staying qualities that go to make a producer out of a prospect.

The Raven Mine.

The Raven Mine, operated by the Raven Mining Co., George Packard, Superintendent and Mr. Johnson, Foreman. This property has an incline shaft, two compartments, to the 1,700. They employ about 30 miners and 20 surface men. Several

thousand feet of exploring has been done on the lower level and it is hoped within the near future that they will strike ore so as to put the property on a paying basis. They have done an enormous amount of work and Mr. George Packard deserves a lot of credit for the way he has kept the property running through all conditions.

Pilot Butte.

Mr. Pat Sheean, Superintendent, Mr. A. Rend, Foreman. Employs about 15 miners and 10 surface men. The shaft is 1,500 feet deep, 500 feet being sunk in 1912. It is the intention to sink this shaft several hundred feet deeper to try and encounter values that will pay in quantities.

Brundy Group.

Is operated by Capt. Wolvin, General Manager, William Creden, Superintendent, Sam Hall, Foreman. The work principally consists of work on surface, of which there are indications in that part of the district, is going to have lots of values which has been overlooked. They are shipping rock off of the surface directly to the Pittsmond smelter, which seems to be of fair grade. At present they are working about 20 miners and that many surface men.

Bullwhacker Mine.

The Bullwhacker mine is being worked by leasers. They are shipping about 100 tons daily of ore that runs from 3 to 5 per cent. Working about 20 men.

Butte Zenith Mining Co.

Mr. Newton, Manager, William Gibson, Foreman. This property is located near Silver Bow Junction. They have started to sink a shaft to the depth of about 500 feet, where they will do some cross cutting to see if they can't encounter some silver and copper values. At present they are working about 10 miners and four surface men.

Butte Central Copper.

Sam McConnell, General Manager and Foreman. Shaft is three compartments down to the 1,000 foot level. Allis-Chalmers engine, two single cages. At the present they are work-

ing about 10 miners and 6 surface men. They are also erecting a concentrator, which will be completed by early spring. Will have a capacity of from 200 to 300 tons per day. They claim to have a great amount of low grade ore which they intend to run through this concentrator when completed.

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